A Database Publication

ATARI USER

Vol. 3 No. 5 September 1987 £1



CHOPPER RESCUE

Their lives are in YOUR hands!

How to

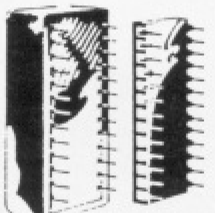
Convert Basic error numbers into words

Merge machine code into your programs

Escape the clutches of the Leather Goddesses

The biggest, top-selling magazine for all Atari 8 bit users

EXPAND THE CAPABILITIES OF YOUR 8 BIT SYSTEM

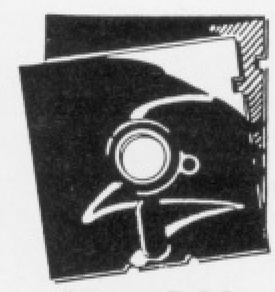


US Doubler

Expanding the 1050 disk drive's strength is what ICD's US Doubler is all about. A true performer in the area of hardware modifications, this chip set quickly transforms your Atari into a powerhouse, radiating with innovative features never before possessed by a 1050. Features like true double density for greater storage, single and dual density support, an accelerated I/O rate designed to triple your speed when combined with SpartaDOS and full compatibility with existing Atari software.

US Doubler two chip set and fitting instructions **£29.95**

This Disk Operating System has been widely acclaimed as the best DOS for the 8 bit Atari range. SpartaDOS from ICD supports everything from 810 disk drives through RAM disks to hard disks. A special menu allows rapid transfer, erasure and locking or unlocking of files using only the Space Bar, Option, Start and Select keys. The utility package supplied also features a 32 character keyboard buffer, intelligent switching between disk densities, a binary file game menu, subdirectories and time/date file stamping.



SpartaDOS Construction Set

SpartaDOS complete with 175 page manual **£29.95**

THE PERFECT COMBINATION – SPARTADOS AND US DOUBLER – ONLY £49.95



P:R:Connection

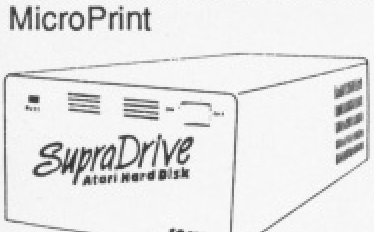
Now you're no longer limited to Atari compatible printers and modems. The P:R: Connection plugs directly into the serial disk drive port of any 8 bit Atari computer and provides the user with a standard Centronics printer interface and two RS-232 serial ports. It also draws its power from your computer which means one less cord fighting for a power point while its compact size leaves your work space virtually clutter free.
The P:R: Connection's serial ports use a fully compatible R: handler and resemble those of the 850 interface with the same signals and functions.

P:R: Connection and manual **£69.95**

MicroPrint

Supra's MicroPrint is a parallel printer interface for the Atari 8 bit series of computers which plugs into the computer's serial peripheral port and then directly into the printer. It works with most parallel printers and 8 bit software and includes a built-in printer cable.

MicroPrint **£29.95**



The SupraDrive AT 20Mb hard disk for the Atari XL and XE series connects directly to the computer's parallel bus, allowing high speed data transfer rates of 8-10,000 bytes per second (approximately 10-15 times faster than the normal Atari drives).
The SupraDrive AT stores more than the equivalent of 200 single density Atari disks and can access any information within milliseconds. All this adds up to an extremely efficient system for the serious Atari 8 bit owner. The SupraDrive AT is supplied with hard disk interface, built-in power supply, manual and SpartaDOS.

SupraDrive AT ready to plug in and use **£749.95**

Rambo XL transforms your 800XL into a mighty 256K computer and makes it memory compatible with the 130XE. Now your XL can support Basic XE extended mode or the standard RAM disk supplied with Atari DOS 2.5. With the RD. COM handler supplied with SpartaDOS you get a 192K RAM disk – enough to duplicate a full double density disk in one pass! You must supply eight 256K DRAMS and the DOS of your choice.

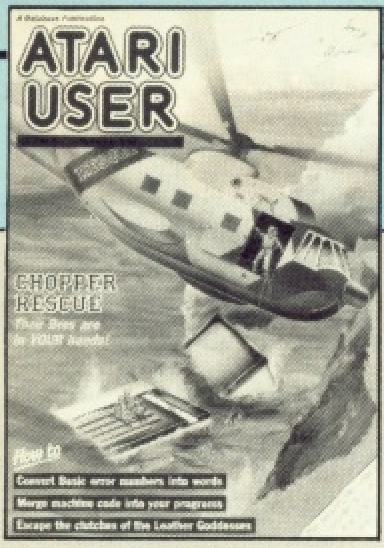
Rambo XL with fitting instructions **£29.95**



RAMBO XL

ALL PRICES INCLUDE VAT AND DELIVERY

Frontier Software P.O. Box 113, Harrogate, North Yorkshire, HG2 0BE, England. Telephone: 0423 67140



Vol. 3 No. 5 September 1987

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Derek Meakin

Features Editor:
Peter Davidson

Production Editor:
Peter Glover

Art Editor:
Heather Sheldrick

Reviews Editor:
Christopher Payne

News Editor:
Mike Cowley

Technical Editor:
André Willey

Advertisement Manager:
Tony Nowell

Advertising Sales:
John Snowden
Nora Lawton

Editorial: **061-456 8383**
Administration: **061-456 8383**
Advertising: **061-456 8500**
Subscriptions: **061-480 0171**
Telecom Gold: **72:MAG001**
Telex: **265871 MONREF G**
Quoting Ref. 72:MAG001
Prestel Mailbox: **614568383**

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"Atari User" welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accommpanied by cassette tape or disc. Please enclose stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication by Database Publications Ltd will be on an all-rights basis.

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Contents

Mini Office II



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Prepare budgets or tables, total columns or rows with ease, copy formulae absolutely or relatively, use a wide selection of mathematical and scientific functions, recalculate automatically – and more!

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Design the layout of a label with the easy-to-use editor, select label size and sheet format, read in database files, print out in any quantity – and more!

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I enclose cheque made payable to Database Software, or debit my Access/Visa card:

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Name ……………………………

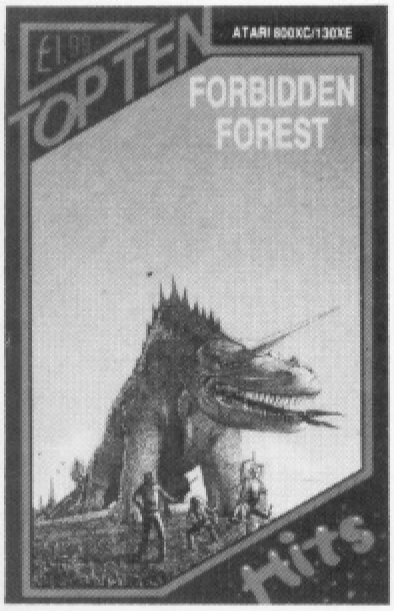
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ORDER HOTLINE: TEL: 061-480 0171

SEND TO: **Database Software, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.**



Budget nasties

A BOW and arrow is the only weapon available to fight off the scary nasties in Forbidden Forest, just re-released for the Atari 8 bit on the Top Ten budget label.

The player controls a small character who has to venture deep within a creepy scrolling forest-scape.

The quest is to defeat the evil Demogorgon – visible only during flashes of lightning. But along the way there are giant spiders, bumble bees, dragons, phantoms and skeleton soldiers. Price £1.99.

Orc on the rampage

SPELLS and a cast of more than 70 characters are all part of the new adventure game Knight Orc for the Atari 8 bit from Rainbird Software (01-240 8838).

In three parts it sets you loose as an oppressed Orc rampaging across adventureland trying to find a way out.

One object of the interactive game is for the Orc to get its own back on the generations of adventurers who have persecuted it. Each of the 70 characters makes its own decisions and lives its own life.

Communication with the other characters, learning spells and solving puzzles are all a vital part of the adventure. Price £19.95

More disc-based games are due

A DISC revolution may be on the cards for Atari 8 bit users. With a new drive due to be launched this month, Atari has begun in depth research into potential boom markets for disc-based software.

This year's launch of the 65XE games machine, with the option to add a keyboard, encouraged the production of cartridge based software as well as the more usual cassette.

But with the rebirth of Atari's own software publishing company label and the increasing list of titles, the prospect of producing disc-based games seems more attractive, says the company's technical director, Les Player. He said Atari had a lot of new 8 bit software going through its testing department at the moment.

This was mainly new arcade games but there were a couple of conversions.

"Most are cassette-based, but we are looking to see how soon we can begin to concentrate on disc-based programs", he said. "If there's a market, we're happy to lead the way".

He explained that in the US cassettes were not used with the 8 bit machines. Over there, discs were the order of the day.

The new drive will be double sided, 5.25in, but pricing and availability details were still being worked out.

Les Player said he had been impressed by the quality of games coming into Atari from smaller software houses and individuals.

"We are really happy to encourage these people. We will have a good look at their work and put it through the testing department. If it's good enough we'll put it out on our own label," he said.

"With the new 65XE selling so well, and a pre-Christmas boom expected, we have got to put out as much good quality 8 bit software as we can.

"And if it works out that people want this on disc, then so much the better".

Deal brings new hardware line

SOLE distribution rights for a range of products from ICD of Illinois has been announced by Frontier Software (0423 67140).

The first product – US Doubler Chip – is a two chip upgrade for the Atari 1050 disc drive which gives true double density for greater storage and an accelerated I/O rate. It is designed to triple the speed of disc operations. Price £29.95.

To complement the Doubler upgrade is SpartaDos which supports 810 disc drives, ram discs and hard discs.

A menu allows rapid transfer, erasure and locking and unlocking of files using only the spacebar, Option, Start and Select keys.

A utility package is also supplied and features a 32 character keyboard buffer, intelligent switching between disc densities, sub-directories and a time/date file stamping. Price £29.95.

The third ICD product to be distributed by Frontier Software is PR Connection which plugs into the serial disc drive port of any Atari 8 bit computer and provides a standard Centronics printer interface and two RS-232 serial ports. Price £69.95.

Sports simulation

DECATHLON, the new sports simulation from Firebird for the Atari 8 bit, allows up to four players to compete against each other in field events.

The game, from Firebird (01-323 6755), however allows only two players to compete against each other in the track events at any one time.

The 10 events are: the 100, 400 and 1500 metre races, long jump, high jump, shot put, discus, javelin, pole vault and the 110 metre hurdles. Price £1.99.

FOLLOWERS of Sherlock Holmes will be pleased to hear that US Gold (021-356 3388) has released an Atari 8 bit version of Datasoft's 221b Baker Street.

The player takes the part of either Sherlock Holmes, Doctor Watson, Irene Adler or Inspector Lastrade – all characters from Conan Doyle's Holmes stories.

Like all good detective stories the player has to pit his or her wits against other players in order to solve a number of crimes. Price £2.99 on cassette and £14.99 on disc.

Link your Atari to the outside world with...

MicroLink

Electronic mail – The cheapest and fastest form of communication possible. It costs the same to send a message to one mailbox as to 500!

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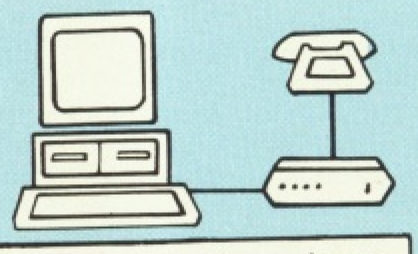
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Gateways – Get through to New York in just five seconds – or key into the EEC computer in Luxembourg, which links you to 600 databases throughout Europe.

When you join MicroLink you've got the world of communications at your fingertips – 24 hours a day. You'll have immediate access to ALL the facilities offered by Telecom Gold ... and a great deal more besides.



Two recommended packages

If you have an 850 interface:
Pace Nightingale manual modem + cable (£116.15) PLUS Mini Office II (£19.95).
Total price: £136.10.

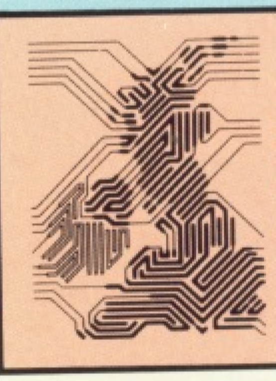
If you don't have an interface:
Miracle WS2000 V21, V23 modem + Datatari interface + cable + Viewterm software.
Total price: £149.95.

With either combination you can also log on to other databases and bulletin boards all round the world.

All you need – apart from your Atari – is a modem, which plugs into your telephone wall socket, plus suitable communications software.

We have provided two possible options on the left.

Whichever equipment you use, you will be able to call MicroLink, open your mailbox, save to disc any messages waiting for you, and disconnect in as little as two minutes.



More than 90 per cent of subscribers can connect to the MicroLink computer at local call rates.

TO FIND OUT MORE
Fill in the coupon and send it to the address below. You will receive full details of services and costs, together with an application form. Complete this and within days you and your Atari will be able to use all the services of MicroLink and Telecom Gold.

Please send me full details about MicroLink, and information sheets about the following hardware and software options (please tick):
☐ Pace package ☐ Miracle package

Name____________________

Address____________________

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Send to: MicroLink, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

ATU

The tender touch

THOSE with a sense of romance and a tender touch on the keyboard of an Atari 8 bit may welcome Plundered Hearts from Infocom.

The romantic adventure is set on board the Lafond Deux, a sailing ship bound for the West Indies, where the heroine is trying to reach her ailing father on the island of St Sinistra.

Pirates attack the ship and amid the destruction and plunder the heroine is snatched from danger by Nicholas Jamison, the pirate captain, who not only saves her life but wins her heart as well.

Plundered Hearts is an interactive fiction game that features drunks, crocodiles and exotic locations as well as pirates. It is the first game from Infocom to be aimed specifically at women.

The story was written by Amy Briggs who read dozens of romance novels and researched 17th century ships and costumes to make the story line as realistic as possible.

Frightening freeways

A FUTURISTIC strategy role-playing game for Atari 8 bit machines has been released by Origin Systems (0666 54326).

In Autoduel the player drives along the freeways of the future where the right of way goes to the driver with the biggest gun.

Somewhere in a total of 16 cities and outlaw-infested highways there are clues to help the player bring Mr Big to justice, but before that a series of other missions have to be undertaken.

The ability to decipher clues is required along with gambling skills, money, and a super car. Price £19.95 on disc.

Competition winners

THE first prize of a full range of MicroProse titles, a framed Silent Service poster and a T-shirt goes to Jason Peasgood from Wigston.

Second prize goes to Mrs A. Kinsella of Fairwater who will be receiving a selection of six Microprose games, a framed poster and T-shirt. M. Gall from Eltham will receive the third prize of a framed poster, copy of Silent Service and T-shirt.

Runners-up prizes of a copy of Silent Service and a T shirt go to: J.P. Hollis, Cheadle Hulme; E. Stockford, Hemel Hempstead; C.W. Taylor, Harlow; E. McKenna, Waterthorpe; A. Docherty, Winchester; A. MacMillan, Carntyne; T.S. Rodwell, Wisbech; C. McPake, Sandyhills; C. Marshall, Sheffield; P. Styrin, Harrogate; K. Harding, Horley; S. Lock, Bristol; R. McChesney, Glasgow; G. Mason, Bishopthorpe; B.U. Stanway, Blackpool; P. Bond, Burton-on-Trent; D. Naylor, Coulsdon; S. Briscoe, Market Drayton; C. Warhurst, Eastfield; S. McFarlane, Chelmsley Wood.

A further 50 people will receive a Silent Service T shirt: C. Sandiford, Preston; G. Davies, Romford; A. Dempster, Selkirk; R. Rowlands, Huddersfield; R. Vine, Somerset; N. Becker, Old Basing; B. Munday, Addlestone; A. Dewdney, Durham; C. Fenn, Aberdeen; F. Johns, Plymouth; D. Smith, St Ebbes; Mr Perkins, Bordon; A. Clark, Garrowhill; D. Garnet, Castleford; A. Brown, Birmingham; S. Tuplin, Market Rasen; J. Barnett, Underwood; M. Fynn, Pontefract; A. Houghton, Erith; S.A. Turner, Fraserburgh; J. Herrington, London; C.E. Geoff, Albrighton; S. Banks, Upminster; N. Abbott, Ipswich; P. Adfield, Widnes; J.A. Gorrie, Bedhampton; D. Baysting, Warminster; E. Wainwright, Skelmersdale; R. Ashmore, Sheffield; M. Manning, Basildon; A. Smith, Selston; G. Ransom, Wilmslow; B. Masson, Bournemouth; B. Augustine, Huddersfield; M.J. Oliver, Crewe; N. Yeates, Leek; L. Partington, Heywood; P. Frost, Wirral; C. Farnella, Preston; B. Greenhough, Lymm; T. Weaver, Seaford; D. Davies, Amluch; K. Joyce, Sheffield; S. Jaghiani, Banstead; A. Thompson, Newton Abbot; M. Standing, Cwmbran; J. Blundell, Maghull; J. Pearson, Newbury; D. Dibiago, Saltash and M. Watson, Darlington.

The Gallup Chart Top 20 Atari Software

This Month	Last Month	Title (Software House)	Price
1	1	**GAUNTLET** *US Gold*	9.95
2	•	**MILK RACE** *Mastertronic*	2.99
3	3	**MICRO RHYTHM** *Firebird*	1.99
4	•	**HOVVER BOVVER** *Mastertronic*	1.99
5	•	**UNIVERSAL HERO** *Mastertronic*	1.99
6	•	**INVASION** *Bulldog*	1.99
7	14	**COLONY** *Bulldog*	1.99
8	2	**ASTROMEDA** *Budgie*	1.99
9	5	**SILENT SERVICE** *Microprose/US Gold*	9.95
10	•	**POWERDOWN** *Mastertronic*	1.99
11	•	**FORBIDDEN FOREST** *Top Ten*	1.99
12	•	**AZTEC CHALLENGE** *Top Ten*	1.99
13	•	**GRIDRUNNER** *Mastertronic*	1.99
14	7	**DEEPER DUNGEONS** *US Gold*	4.99
15	11	**FOUR GREAT GAMES** *Micro Value*	3.99
16	9	**LEADERBOARD** *Access/US Gold*	9.95
17	8	**GUN LAW** *Mastertronic*	1.99
18	4	**ATTACK OF THE MUTANT CAMELS** *Mastertronic*	1.99
19	•	**LA SWAT** *Mastertronic*	2.99
20	•	**AMAUROTE** *Mastertronic*	2.99

Compiled by Gallup/Microscope

Gauntlet holds the top position for yet another month, despite nine new entries and one re-entry – LA Swat at number 19. Budget titles are well in evidence with Mastertronic having four new titles in the Top 10.

MicroLink

in association with

TELECOM GOLD

NEWSLETTER

High tech facts on tap

MICROLINK is helping to speed the flow of information produced by a leading industrial and commercial monitoring organisation.

The Brussels-based European Registry of Commerce keeps tabs on all the Continent's high tech industries, producing monthly reports on everything from printed circuit board manufacturing to industrial lasers.

It also logs all computer-related new products and patents, gives reports on important exhibitions, seminars and conventions, and undertakes market research projects for clients.

"Most of our 300 subscribers are UK based and they will now be able to receive our intelligence services more quickly and economically thanks to MicroLink electronic mail", said Registry managing director Svend Andersen.

"Eventually we intend to establish an online database so that as soon as our reports are prepared they can be accessed by our clients".

Star news flashed online

WHEN discovery of the first supernova for three centuries was confirmed earlier this year, UK astronomy enthusiasts received the exciting news via MicroLink.

The main international astronomical clearing house at the Smithsonian Institute in America flashed the news by telex to the MicroLink mailbox of The Stronomer magazine, information centre and association of Britain's stargazing amateur scientists.

Dramatic details of the massive exploding star were then relayed to the organisation's 500 plus members at home and abroad.

Apart from the supernova's importance, it was a routine operation. For The Astronomer has forged an impressive partnership with MicroLink to speed the news of heavenly discoveries like comets and novas and increase opportunities for their observation.

"Quick announcement is vital if our people are to have a chance to see discoveries before they move away", said Guy Hurst, editor of The Astronomer.

"MicroLink ensures that we can now receive news from the Smithsonian Institute 24 hours a day – a facility enhanced by radiopaging which alerts us to messages arriving in our mailbox.

"This means our people can often observe a phenomenon the same night it is discovered – which was something that was impossible in the old days before MicroLink".

Help for the helpers

COMMUNICATIONS enthusiast Alastair Kennedy is crossing the world to show one of Britain's biggest international aid agencies how MicroLink could help in the Third World.

While he is on a 10-day tour of the Far East and Pacific area he'll use MicroLink to demonstrate the feasibility of electronic mail communications over long distances.

Alastair is Far East programme manager for Voluntary Service Overseas – founded 29 years ago to supply skilled volunteers to train and help the underdeveloped countries.

The organisation currently has 1,200 staff working in 41 countries of Africa, Asia, the Caribbean and the Pacific.

"As a personal initiative I'll be testing MicroLink's ability to improve communications between VSO in London and its field representatives overseas", he said.

Teaching comms

COMPUTERS play a big part in degree courses at the Graduate School of Management in London, where MicroLink is the chosen medium for teaching communications.

The institution has 500 students from all over the world taking courses leading to degrees in law, economics and business administration. There are also diploma courses in a variety of subjects related to the world of business and commerce.

What they all have in common is information technology and its efficient use as a medium of communications. The school has a fully equipped computer science and information technology laboratory.

"We use MicroLink to portray for our students how electronic mail can be an advantage in business", said Dr Ashie Okpoti, Dean of the school.

Faster delivery for postmen

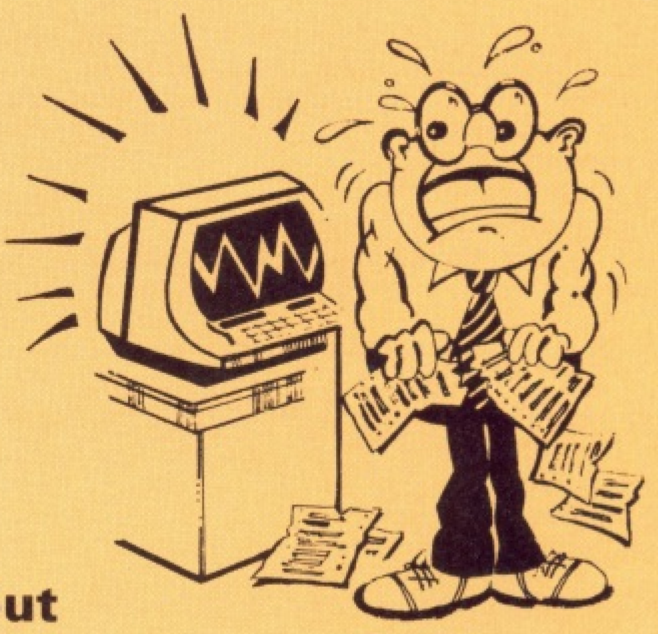
MICROLINK is helping the people who deliver the mail to discover the benefits of computer communications.

The Post Office Unions Council has joined MicroLink so that it can improve communications with its four components – these consist of the Union of Communications Workers, the National Federation of Sub Postmasters, the National Communications Union and the Communication Managers Association.

Secretary of POUC, Steve Connelly said: "Our job is to co-ordinate activities involving two or more of our member unions. Previously we have had to rely mainly on the post and telephone to communicate with their offices. If we wanted to send a telex we had to use an outside agency".

YOUR chance to join MicroLink – turn to Page 6

Do you get the message?



LEN GOLDING makes sense out of Basic's obscure coded advice

IT'S a sad fact of life that most Basic programs don't run correctly first time – even if you've copied them from our listings. Often this is due to relatively minor typing errors such as using the letters O and I instead of zero and one, typing two commas together in a DATA line or misspelling a variable name.

It's also easy to miss out a vital statement, or even a complete line. Faults of this kind are relatively easy to trace once you know what you're looking for, but Basic's error messages don't help much – "ERROR 13 AT LINE 200" is not particularly illuminating, especially if you don't have a code book handy.

This program makes the job of debugging a lot easier by printing genuine, understandable error messages, alongside Basic's own cryptic clues.

The program autoboots so the cassette and disc versions are not identical, since they use two different systems. Program I makes an autoboot cassette, while program II creates an AUTORUN.SYS disc file – we explained the difference in the April, May and June issues of *Atari User*.

The cassette version also leaves out all messages relating exclusively to disc drives and RS232 interfaces, so it takes up less memory and loads in about 50 seconds.

The routine works by checking address 185 every fiftieth of a second to see if Basic has stored an error number there. If so, it sorts through the error messages in sequence until it finds the one which corresponds to that number. Since these messages vary in length, it must be able to tell where one ends and the next begins, and we provide this information by typing the last character of each message in inverse.

If you fail to do this you will get some weird results.

Whichever version you choose, take great care in typing the numeric Data statements, since they contain machine code programs which will crash if you make even the slightest typing error. And be sure to save a copy before you try running it.

Also remember that we're dealing with a two-stage process – the Basic program is not itself the error generator. It just makes a master file containing the error generator routine. It's this master file which must be loaded into memory before the routine will work.

To make the cassette version, run Program I and when the two beeps sound follow the usual CSAVE procedure. To load the resulting master file, switch power off, rewind the tape, switch on again while holding down the Start key, then press any key to load the program.

When READY appears the new error routine is ready for action. The disc version is even easier. Just run Program II to make an AUTORUN.SYS master file which will install itself automatically on power-up.

With the master file safely loaded, you can test the system by generating a few deliberate errors. Try:

```
10 PRINT PEEK(-1)
or 10 POKE106,PEEK(744)+10
:GRAPHICS 8
```

When you run them the first should give you: "ERROR 3 AT LINE 10", followed by "Illegal numeric value". The second should give "ERROR 147 AT LINE 10", followed by "Too little RAM for GRAPHICS mode". Disc users should also try:

```
10 LOAD "D:NOSUCH"
```

This should give ERROR 170 and "File not found". If you get the wrong message, the chances are that you've forgotten to end one or more messages with an inverse character, or have left out an inverse asterisk.

If the computer locks up completely, or won't accept any lines of Basic, check your original typing of the program and especially the machine code data statements and all lines which contain variables M, ML and MH.

If you have to correct any mistakes, save the corrected Basic program and then run it to make a new master file.

When using or modifying the error message generator, there are a few important points to bear in mind. First, it uses stage one of the vertical blank interval. If your Basic program alters the addresses which control immediate VBIs – notably 546 and 547 – the error routine will stop working. Fortunately most programmers prefer to use the deferred (stage two) VBI, which won't affect the error messages.

Second, the cassette version is set as low as possible in RAM (1792 onwards), to leave maximum space for your Basic programs. This means that you cannot use it in conjunction with any peripheral which appropriates this same memory area.

The only common one likely to

Turn to Page 10 ►

◀ *From Page 9*

cause problems is an RS232 interface, so if you're using an 850 module just to drive a printer, make sure you don't switch it on until after the READY message appears. Disc drive users don't have this problem, since the disc version is assembled to 7424, which is above DOS and the RS232 handler's memory space. It's easy to modify the message wording if you'd prefer something like: "Switch the thing on, Dumbo", instead of "Device does not respond".

Simply delete the data you want to change and insert your new message, making sure its last character is inverse, then run the program to make a new master file incorporating the changes.

If you want to leave out any messages which could legitimately be generated, replace them with an inverse blank space. This will not print on screen, but keeps the counting system in step.

The inverse asterisks serve a similar function – they allow the routine to step over any numbers which are never used or, in Program I, the ones that can't be generated by a cassette system alone.

Program I - Cassette

```
10 BFR=(PEEK(106)-24):POKE 106,BFR:GRA
PHICS 0:REM Reserve a temporary buffer
20 BFR=BFR*256:REM Address of start of
 buffer
30 FOR X=0 TO 46:READ D:POKE 1536+X,D:
NEXT X:REM Load the new SAVE routine i
nto page 6
40 DATA 104,104,133,204,104,133,203,10
4,133,206,104,133,205,162,16,169,11,15
7,66,3
50 DATA 165,203,157,68,3,165,204,157,6
9,3,165,205,157,72,3,165,206,157,73,3
60 DATA 32,86,228,96,67,58,155
70 REM Load the program temporarily in
to the reserved buffer space
80 X=0:RESTORE 210
90 READ D:IF D=-1 THEN 110
100 POKE BFR+X,D:X=X+1:GOTO 90
110 DIM D$(100):TRAP 140:RESTORE 350
120 READ D$:FOR Z=1 TO LEN(D$):POKE BF
R+X+Z,ASC(D$(Z,Z)):NEXT Z
130 X=X+LEN(D$):GOTO 120
140 FLEN=INT((X+127)/128):POKE BFR+1,F
LEN
150 M=1792+X+1:MH=INT(M/256):ML=M-256*
MH:REM New value for MEMLO
160 POKE BFR+17,ML:POKE BFR+22,MH
170 REM Now read the data from the tem
porary buffer into an Autoboot cassett
e file
180 OPEN #1,8,128,"C:"
190 X=USR(1536,BFR,PEEK(BFR+1)*128)
200 END
210 DATA 0,3,0,7,16,7,169,60,141,2,211
,24,96,76,145,7,169,24,141,231
220 DATA 2,169,8,141,232,2,173,33,3,13
3,205,173,34,3,133,206,160,15,177,205
230 DATA 153,8,8,136,16,248,169,102,14
1,12,8,169,7,141,13,8,160,66,162,7
240 DATA 169,6,32,92,228,96,173,4,8,20
8,29,165,185,240,25,16,3,56,233,106
250 DATA 170,202,142,4,8,169,8,141,33,
3,169,8,141,34,3,169,0,141,3,8
260 DATA 76,95,228,172,3,8,192,11,240,
9,185,134,7,238,3,8,160,1,96,165
270 DATA 205,141,33,3,165,206,141,34,3
,169,155,160,1,96,88,61,85,83,82,40
280 DATA 49,56,48,53,41,104,169,24,133
,203,169,8,133,204,206,4,8,240,32,48
290 DATA 56,160,0,177,203,48,3,200,16,
249,200,140,7,8,165,203,24,109,7,8
300 DATA 133,203,165,204,105,0,133,204
,76,154,7,169,0,141,6,8,172,6,8,177
310 DATA 203,48,9,32,228,7,238,6,8,76,
196,7,41,127,32,228,7,169,0,141
320 DATA 4,8,169,155,32,228,7,96,141,5
,8,169,11,141,66,3,169,5,141,68
330 DATA 3,169,8,141,69,3,162,1,142,72
,3,202,142,73,3,32,86,228,96,0
340 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,-1
350 REM The error message table starts
 here.
360 REM THE LAST LETTER IN EACH MESSAG
E, AND ALL THE ASTERISKS, MUST BE TYPE
D IN INVERSE (see text).
370 DATA Out of memory
380 DATA Illegal numeric value
390 DATA Too many variables
400 DATA String length exceeded
410 DATA DATA list exhausted
420 DATA Number greater than 32767
430 DATA Tried to INPUT wrong type of
variable
440 DATA Array or string dimension err
or
450 DATA Expression too complex
460 DATA Can't divide by zero
470 DATA Non-existent line number
480 DATA NEXT without FOR
490 DATA Line too long
500 DATA GOSUB or FOR line deleted
510 DATA RETURN without GOSUB
520 DATA Can't make sense of this line
530 DATA Incorrect use of VAL
540 DATA Not enough RAM
550 DATA Can't use channel 0 or >7
560 DATA Not LOAD format
570 DATA BREAK key pressed during I/O
580 DATA Channel already open
590 DATA Non-existent device
600 DATA Channel opened for output onl
y
610 DATA XIO syntax error
620 DATA Channel not open
630 DATA Can use only channels 1 to 7
640 DATA Channel open for input only
650 DATA End of file
660 DATA I/O error: Data record too lo
ng
670 DATA Device does not respond
680 DATA Device malfunction
690 DATA Serial communication fault
700 DATA Cursor out of range
710 DATA Serial communication fault
720 DATA Serial communication fault
730 DATA *,*
740 DATA Requested action is impossibl
e
750 DATA Too little RAM for GRAPHICS m
ode
760 DATA *,*,*,*,*.*,*,*,*,*,*,*,*,*,*
770 DATA Unrecoverable I/O crash
780 DATA *,*,*,*
790 DATA Unknown XIO command
```

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
10	16518	20	10293	30	18348
40	12019	50	10982	60	4362
70	17536	80	2882	90	4314
100	5005	110	5704	120	11361
130	3709	140	6797	150	12897
160	5937	170	21671	180	3015
190	5780	200	836	210	9854
220	10702	230	10390	240	10605
250	9920	260	10083	270	10593

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
280	10657	290	10371	300	10555
310	9956	320	9917	330	9936
340	6813	350	10902	360	20123
370	5210	380	7401	390	6586
400	7673	410	7385	420	7984
430	11627	440	10433	450	8357
460	6596	470	8792	480	5430
490	5253	500	7486	510	6590
520	10096	530	6563	540	5505

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
550	7313	560	4861	570	9088
580	6925	590	7396	600	9960
610	5671	620	5774	630	8255
640	8896	650	3994	660	9535
670	8343	680	7019	690	9174
700	7312	710	9174	720	9174
730	2208	740	10470	750	9309
760	10644	770	7955	780	3196
790	7257				



Program II - Disc

```
10 START=7424:REM Address where code w
ill be loaded
20 COLDST=START+3:SH=INT(COLDST/256):S
L=COLDST-SH*256:REM address to jump to
 on coldstart
30 BFR=PEEK(106)-24:POKE 106,BFR:GRAPH
ICS 0:REM Reserve a buffer for the cod
e, so it can be saved in one operation
40 BFR=BFR*256:REM Address of start of
 buffer
50 X=0:RESTORE 200
60 READ D:IF D=-1 THEN 80
70 POKE BFR+X,D:X=X+1:GOTO 60:REM Read
 machine code into buffer
80 DIM D$(100):TRAP 110:RESTORE 390
90 READ D$:FOR Z=1 TO LEN(D$):POKE BFR
+X+Z-1,ASC(D$(Z,Z)):NEXT Z
100 X=X+LEN(D$):GOTO 90
110 F=BFR+X:POKE F,224:POKE F+1,2:POKE
 F+2,225:POKE F+3,2
120 POKE F+4,SL:POKE F+5,SH:REM Write
6-byte footer
130 Y=START+X-7:YH=INT(Y/256):YL=Y-YH*
256:REM Address of last byte before fo
oter
140 M=Y+1:MH=INT(M/256):ML=M-256*MH:RE
M new value for MEMLO pointer
150 POKE BFR+4,YL:POKE BFR+5,YH:REM In
sert file end address into header
160 POKE BFR+34,ML:POKE BFR+39,MH:REM
Insert new value for MEMLO
170 OPEN #1,8,0,"D:AUTORUN.SYS"
180 FOR B=0 TO X+5
190 PUT #1,PEEK(BFR+B):NEXT B
200 DATA 255,255,0,29,0,0
210 DATA 76,156,29,165,12,141,25,29,16
5,13,141,26,29,169,24,133,12,169,29,13
3
220 DATA 13,76,27,29,32,76,29,169,35,1
41,231,2,169,30,141,232,2,173,33,3
230 DATA 133,205,173,34,3,133,206,160,
15,177,205,153,19,30,136,16,248,169,11
3,141
240 DATA 23,30,169,29,141,24,30,160,77
,162,29,169,6,32,92,228,96,173,15,30
250 DATA 208,29,165,185,240,25,16,3,56
,233,106,170,202,142,15,30,169,19,141,
33
260 DATA 3,169,30,141,34,3,169,0,141,1
4,30,76,95,228,172,14,30,192,11,240
270 DATA 9,185,145,29,238,14,30,160,1,
96,165,205,141,33,3,165,206,141,34,3
280 DATA 169,155,160,1,96,88,61,85,83,
82,40,55,52,50,52,41,104,169,35,133
290 DATA 203,169,30,133,204,206,15,30,
240,32,48,56,160,0,177,203,48,3,200,16
300 DATA 249,200,140,18,30,165,203,24,
109,18,30,133,203,165,204,105,0,133,20
4,76
310 DATA 165,29,169,0,141,17,30,172,17
,30,177,203,48,9,32,239,29,238,17,30
320 DATA 76,207,29,41,127,32,239,29,16
9,0,141,15,30,169,155,32,239,29,96,141
330 DATA 16,30,169,11,141,66,3,169,16,
141,68,3,169,30,141,69,3,162,1,142
340 DATA 72,3,202,142,73,3,32,86,228,9
6,0,0,0,0,0,0,0,0,0,0
350 DATA 0,0,0,0,0,0,0,0,0,0,0,-1
360 END
370 REM The error message table starts
 here.
380 REM THE LAST LETTER IN EACH MESSAG
E, AND THE ASTERISKS AT 790 AND 850, M
UST BE TYPED IN INVERSE (see text).
390 DATA Out of memory
400 DATA Illegal numeric value
410 DATA Too many variables
420 DATA String length exceeded
430 DATA DATA list exhausted
440 DATA Number greater than 32767
450 DATA Tried to INPUT wrong type of
variable
460 DATA Array or string dimension err
or
470 DATA Expression too complex
480 DATA Can't divide by zero
490 DATA Non-existent line number
500 DATA NEXT without FOR
510 DATA Line too long
520 DATA GOSUB or FOR line deleted
530 DATA RETURN without GOSUB
540 DATA Can't make sense of this line
550 DATA Incorrect use of VAL
560 DATA Not enough RAM
570 DATA Can't use channel 0 or >7
580 DATA Not LOAD format
590 DATA BREAK key pressed during I/O
600 DATA Channel already open
610 DATA Non-existent device
620 DATA Channel opened for output onl
y
630 DATA XIO syntax error
640 DATA Channel not open
650 DATA Can use only channels 1 to 7
660 DATA Channel open for input only
670 DATA End of file
680 DATA I/O error: data record too lo
ng
690 DATA Device does not respond
700 DATA Device malfunction
710 DATA Serial communication fault
720 DATA Cursor out of range
730 DATA Serial communication fault
740 DATA Serial communication fault
750 DATA Can't write to this disk
760 DATA Read/write inconsistency
770 DATA Requested action is impossibl
e
780 DATA Too little RAM for GRAPHICS m
ode
790 DATA *,*
800 DATA Serial port already open
810 DATA Concurrent mode I/O not enabl
ed
820 DATA Illegal user-supplied buffer
830 DATA Serial port can't do 2 things
 at once
840 DATA Operation needs concurrent mo
de
850 DATA *,*,*,*,*
860 DATA Drive must be D: or D1 to D4
870 DATA Too many files open
880 DATA Disk full
890 DATA Unrecoverable I/O crash
900 DATA POINT error, or directory scr
ambled
910 DATA Illegal file name
920 DATA POINT data length error
930 DATA File locked
940 DATA Unknown XIO command
950 DATA Disk directory full
960 DATA File not found
970 DATA Can't POINT beyond open file
```

Get it right!

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
10	11880	20	19861	30	26641
40	10293	50	2877	60	4133
70	13834	80	5697	90	11505
100	3683	110	9520	120	10581
130	18073	140	14710	150	15893
160	14187	170	5165	180	2621
190	4688	200	3349	210	11156
220	10352	230	11663	240	10766
250	11415	260	10479	270	10629
280	10639	290	10804	300	11393
310	10661	320	10938	330	10353
340	8267	350	4469	360	836
370	10902	380	21734	390	5210
400	7401	410	6586	420	7673
430	7385	440	7984	450	11627
460	10433	470	8357	480	6596
490	8792	500	5430	510	5253
520	7486	530	6590	540	10096
550	6563	560	5505	570	7313
580	4861	590	9088	600	6925
610	7396	620	9960	630	5671
640	5774	650	8255	660	8896
670	3994	680	9631	690	8343
700	7019	710	9174	720	7312
730	9174	740	9174	750	8820
760	9413	770	10470	780	9309
790	2208	800	9084	810	9827
820	9796	830	11321	840	10714
850	4222	860	8533	870	7237
880	4701	890	7955	900	11165
910	6026	920	7913	930	4517
940	7257	950	7934	960	5912
970	8479				

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Painless programs . . .

ANDRÉ WILLEY shows how to download them from MicroLink

AS more and more of you are becoming interested in the communications revolution and the advantages of electronic mail we have been receiving lots of letters asking about downloading our listings from the MicroLink mainframe computer.

MicroLink is a vast electronic storage and mail system which is also linked into many other computers giving you access to a whole range of online services. One of the facilities offered is the ability to obtain computer software from the system – otherwise known as downloading telesoftware. Among the programs you can download are listings from *Atari User*.

But how do you go about it? Well, assuming you are online to MicroLink you can access the download section by typing TS from the main > prompt. The main telesoftware menu allows you to choose programs for your particular computer, or to go straight to the latest software.

You can download your programs in one of three modes. The first two are variations of standard Ascii text which are very straightforward to use but can occasionally be corrupted if you get a bad phone connection. The other mode – Kermit – is a special error-correcting protocol but is rather slower in transmitting files.

However, unless your communications software supports Kermit – and most 8-bit Atari programs don't – you will not be able to take advantage of this development. If you do have access to a Kermit supporting comms package you can get more information by typing HELP KERMIT at the > prompt.

All of MicroLink's telesoftware can be downloaded in the form of Ascii text files and, in order to do this, all you need is a comms program (sometimes known as a terminal emulator) which has the ability to capture the incoming text and save it to disc or tape for later viewing. You might find this is refered to as *spooling to disc* in your manual. The Xmodem system provided on some comms software doesn't at present work with MicroLink.

There are many software packages you can use, including the new Mini Office II comms section which is designed specifically to make it easier to talk to MicroLink and similar systems.

Beware of using software which can only store incoming text in a memory buffer. Many of the download files are quite long and would quickly fill up the available ram unless there is a facility to dump (or spool) to disc as the buffer fills up.

MicroLink is a text system and, as such, cannot handle any of the Atari graphics characters or machine code files. To get around this a special system known as Expanded Ascii has been developed.

The procedure for downloading both types of file is very similar. We'll look at the procedure with Mini Office II, but similar procedures apply to all software and your manual will show you the relevant commands for your own.

The latest software is stored in a way that makes it much easier to find the program you want and soon all the software will be stored that way. So let's look at how to download software from this section.

After typing TS enter the appropriate menu number at the first telesoftware menu (currenty on number 7). You will then see:

<S>earch <A>scii <K>ermit <H>elp <Q>uit:

Enter S followed by the type of file you're looking for. So, for example *S ATU* would find any Atari user program, *S ATARI 8B* lists Atari 8 bit programs. After confirming your choice you will now see a list of programs available with any relevant information.

Choose the file you want, then to download it enter A followed by the file number given. For example, *AF1242* would download file F1242. Both Ascii and Expanded Ascii files are downloaded with the A option.

You are next presented with some details of the program and given a chance to save them if you wish. After this helpfile you are told to prepare to save the program and it's at this point that you turn on your capture-to-disc facility.

On Mini Office II this means typing Control+Shift+R for Receive File, entering a filename and then selecting the mode. This should be 2 for a standard Ascii file and 3 for an Expanded Ascii one. Files with a type shown as A are Ascii and B are expanded Ascii.

You are now ready to begin the download, so hit the Start button to begin the capture and press Y+Return to let MicroLink know it can start sending. The text will now be displayed on your screen, with occasional pauses as your Atari sends a block to the disc file.

When the incoming text stops completely, press the Start key to close the capture file and hit Return to tell MicroLink to go back to the menu.

If your communications software doesn't support Expanded Ascii you can download it as standard Ascii and then convert it into a binary file. There is a short Ascii program called Expanded Ascii on MicroLink to enable you to do this quickly and easily. See the Help information on that program for more details.

When you have logged off MicroLink you should re-boot your computer and go to Basic. An Ascii file may be loaded by using:

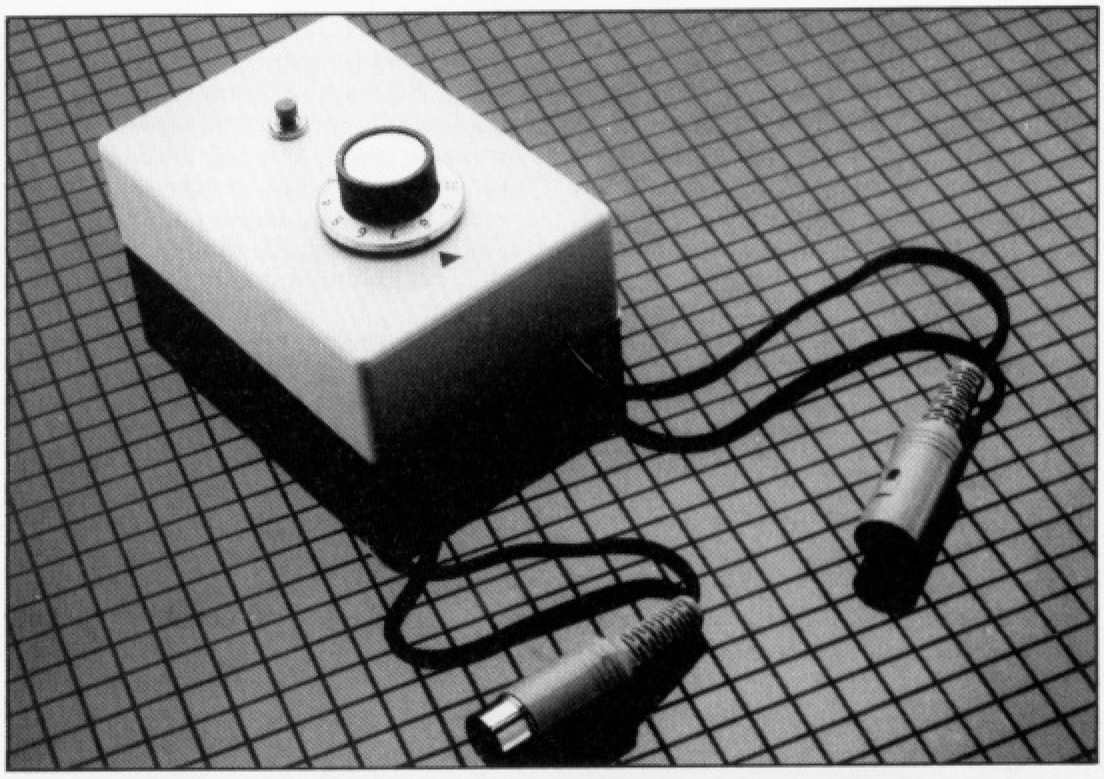
```
ENTER "D:filename".
```

Expanded Ascii files are usually saved Basic programs and are loaded normally with:

```
LOAD "D:filename"
```

Some files are machine code binary files and these should be loaded by going to the Dos menu and typing L for Binary Load and then entering the filename. More information about the type of file can be obtained from the Help file associated with each program.

This should have given you an insight on MicroLink's telesoftware facility so there's no need to spend hours and hours typing in our programs when you can do it online in minutes. ■



Code lock

A device to keep unauthorised hands away by LEN GOLDING

ARE you tired of people using your computer without permission? Here's a gadget that could be useful at home, school, in computer groups, youth clubs or charity organisations.

It locks your computer by blocking the power supply until you enter a secret five-digit code.

There's no key to be lost, stolen or copied. The choice of code number is entirely up to you and can be changed easily if the need arises.

The gadget fits neatly into your power supply lead.

It doesn't require software and several fail-safe features are built in. It can control any Atari 8 bit computer, disc drive or program recorder – in fact anything that uses either a 5v DC or 6v to 9v AC power supply, at up to 2 amps.

Figure I shows the circuit. It's quite complicated, and you don't need to understand how it works in order to build and use it, but for electronics buffs here's the operating theory.

The lock must be able to detect when a digit is being entered, and to discriminate between correct and incorrect entries. These three states are indicated by different voltages on the signal line: No digit = 2.5v, correct digit = 5v and an incorrect digit = 0v (or thereabouts). IC2a and IC2b are wired as comparators, to monitor the signal-line voltage.

If it is held at 2.5v nothing much happens. If it rises above 3.3v, IC2a sends a clock pulse to IC1. If it falls below 1.7v, IC2b sends a reset pulse to IC1.

IC1 is a decade counter with 10 outputs, though we use only five in this application. They are normally held low (0v), but go high (5v) in sequence from 0 to 9 when clock pulses are received at pin 14.

If the count reaches five, pin 12 goes from high to low, and we use this as the success signal. Any incorrect digit along the way will generate a reset pulse (via IC2b) which sets the counter back to zero, wiping out the memory of anything previously entered.

The trick is to ensure that only the correct sequence of five digits can generate five clock pulses in succession. To see how this is done, let's trace the operation of Figure I, where the correct combination is 24579.

When you first switch on, C3 sends a brief positive pulse to pin 10 of IC2 and, via D1 and R1, to pin 12 of IC1. This does two things. First it latches the output of IC2c high, so TR1 turns on and RL1 pulls into its closed position. No current can flow to the computer when the relay is in this state.

Second, it ensures that IC1 is set to zero, so pin 3 will be the only high output.

Now this output is connected to the S1 pin which corresponds to two on the dial. So if you rotate the dial to two and press S2, the 5v at output 0 will appear on the signal line, generating the first clock pulse.

Output 0 now goes low, and output 1 goes high, so the second clock pulse will be generated only if you enter the digit which is wired to output 1 – in this case four. This sends output 2 high, ready for the third digit (five), and so on, until the entire combination has been correctly entered.

When the count reaches five, IC1 pin 12 goes low. This drives the output of IC2c low, and R7 ensures it stays that way. TR1 turns off, so RL1 clicks into its open position. Current can now flow through the relay contacts, and the computer switches on.

Connecting the outputs of IC1 to different pins on S1 will program the lock to accept different combinations. Almost any five-digit code can be used

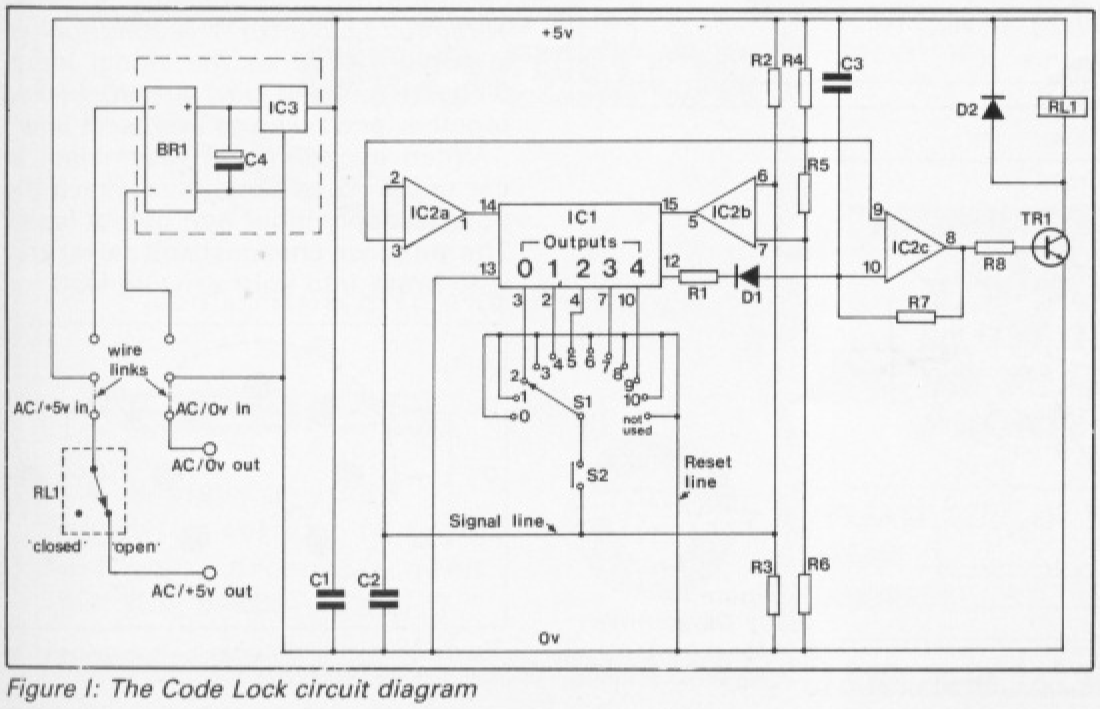


Figure I: The Code Lock circuit diagram

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– the only restriction is that no digit may appear more than once.

There are a few components we haven't mentioned so far. C1 reduces electrical noise on the supply lines which might otherwise cause IC1 to count incorrectly. R2 and R6 produce reference voltages for IC2a and IC2b. C2 helps to de-bounce S2, and D2 protects TR1 from voltage spikes generated by the relay.

C4, BR1 and IC3 are needed only if you want to control 400/800 computers, disc drives, 410 program recorders or other items of equipment which use a 6v to 9v AC supply. The PSU for XL and XE models delivers 5v DC, so it can power the code lock directly.

Figure II shows the PCB pattern for those of you who like to etch your own, but a ready etched and drilled PCB is available from RH Design, as always. Holes for the terminal block and BR1 should be 1mm diameter, fixing holes are 3mm, and all other pads should be drilled 0.8mm.

Now let's look at construction. Figure III shows the component layout for the version which operates with AC power supplies. If you're using an XL/XE power pack, omit BR1, C4 and IC3, and fit the two short wire links from A to B and D to E, instead of from A to C and D to F.

Several of the components are polarised, so they must be soldered the correct way round. BR1 has + marked, C4 has an indentation at the positive end, and the diodes have a coloured band to mark their cathodes.

Take particular care that IC1 and IC2 are inserted with pin 1 in the correct position, and that IC3 (if you're using it) goes with its flat metal side towards C4.

S1 and S2 are mounted on the case, and connected to the board via the terminal block. Fig IV shows how they are wired for the combination 24579. S1 is a 12-way switch, but the recommended control knob has only 11 positions marked (0 to 10). However, if you remove the fixing nut and shakeproof washer, you will see a small ring with a tooth which limits the spindle's rotation.

Prise this out and move it round until the tooth points at 11, then re-insert it. Now the switch will rotate to only 11 positions, matching the control knob markings.

The contacts on S1 are numbered, so it's easy to see where you are. One corresponds to zero on the control knob so, when you've chosen your combination, add 1 to each digit and solder a wire to the pin with that number. (That's why in Figure IV, the combination 24579 appears to be wired for 3,5,6,8,10). The common pin is taken via S2 to the signal input, while all unused pins are connected together and taken to the Reset line.

When everything is assembled, fit the unit into its case, then attach the power supply input and output leads. The simplest, cheapest and safest way is to break into your existing lead.

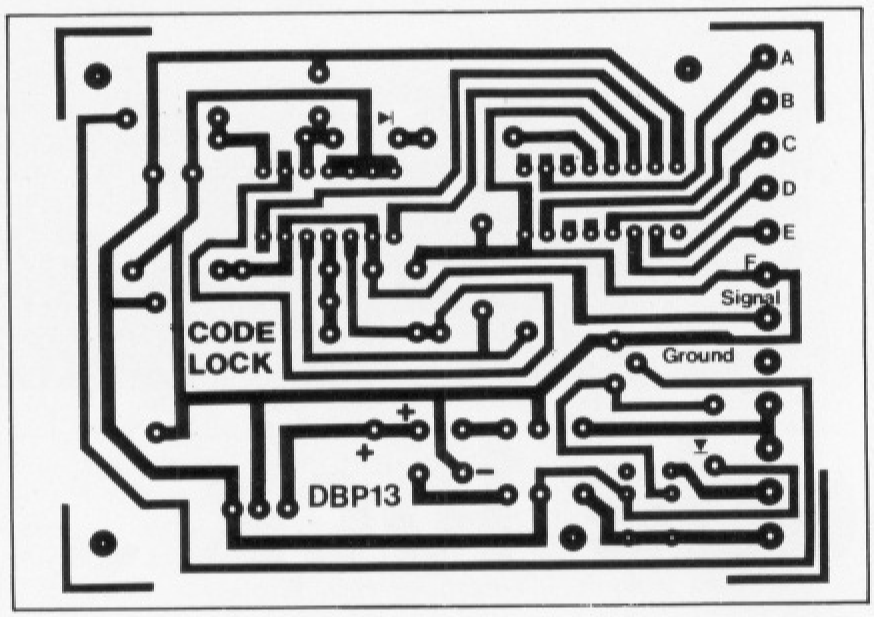


Figure II: The PCB pattern for Code Lock

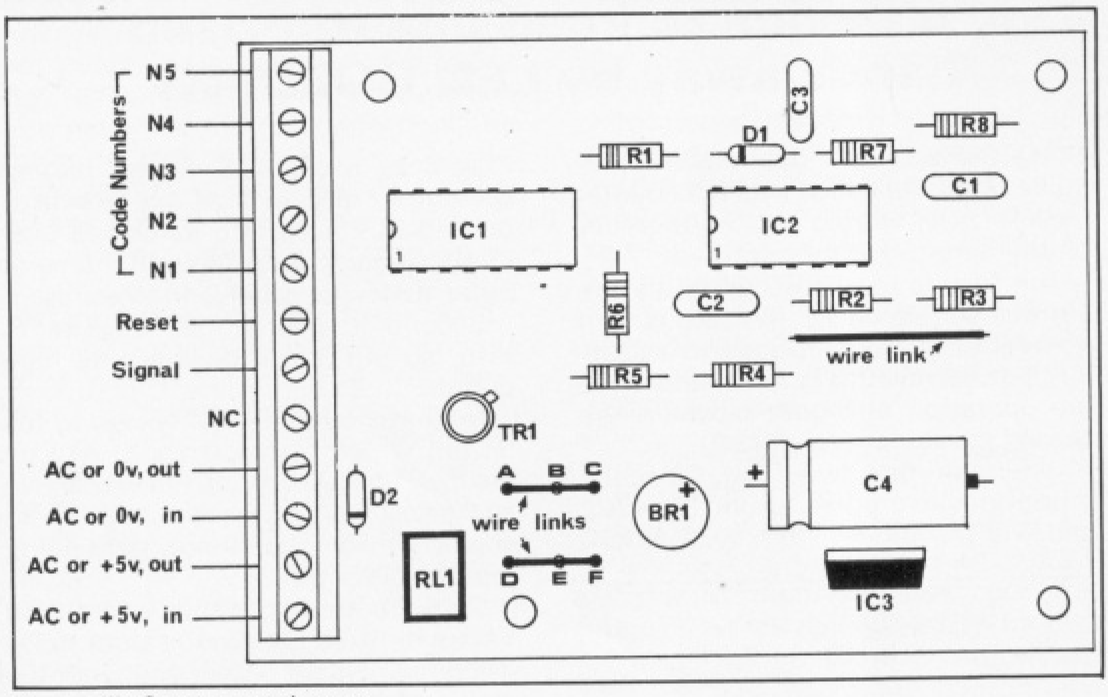


Figure III: Component layout

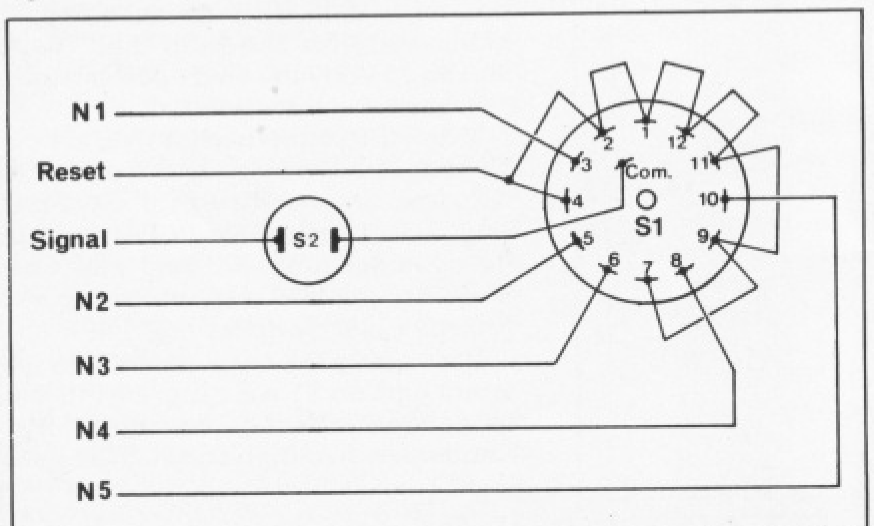


Figure IV: S1 shown wired for 24597

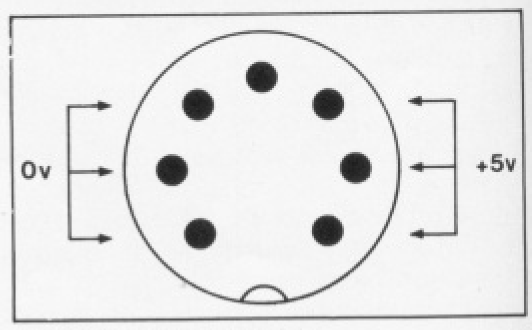


Figure V: View into plug fitted to XL/XE PSUs

You could fit an extra plug and socket but in this case remember that unless your power supply plug is well taped into the socket the gadget is pointless.

In AC mode, it doesn't matter which way round the two power leads are connected, so long as you get the input and output right.

Note that if you're using an XL or XE power pack, the positive and negative leads for both input and output must be connected the right way round, or you will almost certainly damage the code lock, your computer, or both.

Positive is the striped lead, negative is all black, and Figure V shows the pin connections.

For security reasons, you might like to run a line of white insulating tape around the crack between the case and its lid. It won't keep determined people out, but at least you will know if anyone has been tampering.

PARTS REQUIRED

		Maplin Code
R1	33k orange/orange/orange	M33K
R2-R6	47k yellow/violet/orange	M47K
R7	100k brown/black/yellow	M100K
R8	2.2k red/red/red	M2K2
C1-C3	0.1mfd disc ceramic	YR75S
C4	330mfd 25v axial	FB68Y *
IC1	4017BE decade counter	QX09K
IC2	LM324 quad op-amp	UF26D
IC3	uA7805 +5v regulator	QL31J *
BR1	W005 bridge rectifier	QL37S *
D1,D2	1N914 signal diode	QL71N
TR1	BC108C transistor	QB32K
S1	1 pole 12-way rotary switch	FF73Q
S2	Push-to-make switch	FH59P
RL1	Micro-miniature 6v relay	FM89W
	14-pin DIL socket	BL18U

	Maplin Code
16-pin DIL socket	BL19V
12-way PCB terminal block	RK74R (optional)
Plastic box PB1 (white)	LF01B
Control knob type NK2	RX01B
Pack 6BA x ⅛" spacers	FW33L
Pack 6BA + ½" c/s bolts	BF12N
Pack 6BA nuts	BF18U

** Not needed for XL/XE computers - see text*

All components available from Maplin Electronic Supplies, PO box 3, Rayleigh, Essex, SS6 2BR

Printed circuit board (order code DBP13) price £2.38 inc VAT and postage. Available from RH Design, 137 Stonefall Avenue, Harrogate, North Yorks. Tel. 0423 880520.

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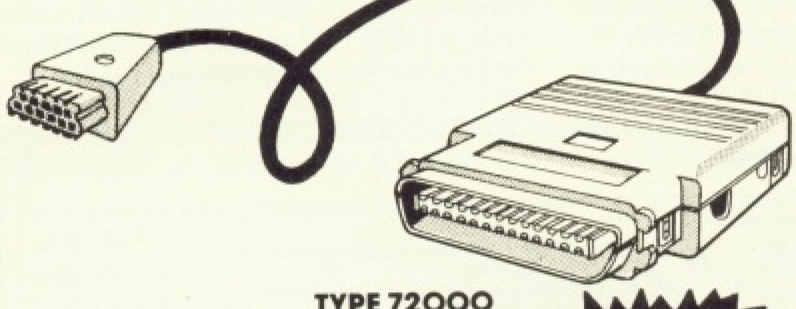
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Floyd is back!



Program: Stationfall
Price: £24.99
Supplier: Infocom, c/o Activision, 23 Pond Street, Hampstead, London NW3 2PN.
Tel: 01-431 1101

"LET'S play a game of Hider-and-Seeker". Now who would say that? Who could almost drive you to drink one minute and in the next stimulate an overwhelming sense of affection?

Who would carry out an act of heroic proportions and lay down his life for you? And who, if you were so unkind as to give him an undeserved kick, would mutter "Why did you do that? I think a wire's shaken loose", and go off into a corner and sulk?

It could be no one but Floyd, the scatterbrained robot from Infocom's Planetfall. No one who has met Floyd is ever likely to forget him. And if you haven't had the pleasure, now's your chance.

For the good news is – Floyd's back! That loveable, maddening mass of mischief returns with a bang in Steve Meretsky's brilliant sequel, Stationfall.

The author of Planetfall, in which Floyd made his illustrious debut, won an award for Best Computer Software Designer. Make no mistake, we are talking real quality here.

You don't need to have played Planetfall to enjoy Stationfall (but why play one superb game when you can play two?). As a result of your heroism in Planetfall, you have been promoted.

Before you were just a scrubber of decks and cleaner of grotch cages. In Stationfall you are now... well, although you're a much higher rank, the job is just as mind-numbingly boring.

Your tedious scrubwork has been replaced with tedious paperwork. Forms, forms and more forms. Take today's thrill-a-minute assignment, for example.

You have to pop over to Gamma Delta Gamma 777-G Space Station and pick up a supply of Regulation Black Form Binders Request Forms. Ho, hum.

Aboard your ship the SPS Duffy is your former arch-tormentor Blather (who has since been demoted to desk-scrubbing duties) and a trio of robots in the robot pool. There's Rex and Helen and – yippee! – your old playmate Floyd. You can only take one from the pool and, of course, it's got to be Floyd.

Try picking one of the others and just see what happens. Even if it were technically right to pick Rex or Helen, could you bear to see Floyd's lower jaw begin to quiver as though he were about to cry? I couldn't.

With the aid of the documentation included in the package, it doesn't take too much effort to plot your course and find the way to the massive Space Station complex. The 10 blueprints that are also included with the game certainly come in handy with the mapping once you've arrived.

You and Floyd are not alone on the station for long. In walks another robot, a bit of a bookworm apparently since he's reading a volume of poetry.

Turns out this is Plato who is rather like an older, wiser version of Floyd – fortunately he's just as friendly.

Floyd and Plato are very much in the mould of all good comedy double-acts – R2D2 and C3PO spring to mind. It is one of the great pleasures of this game to watch them at work and play (which they do incessantly, mostly without taking any notice of you).

There are other inhabitants, too – an ostrich and an Arturian balloon creature (shades of Dark Star?). Your mission is certainly turning out to be a far cry from the prosaic paper hunt you thought it would be, even if it does at the moment seem to be lacking in mystery and mayhem.

But it soon becomes apparent that all is not well. The Commander's detailed log makes uneasy reading as it charts a gradual decline of the normally smooth running of machinery and procedures. The problems all seemed to begin with the arrival of that strange alien craft...

You discover at first hand that things are indeed going very wrong. Automatic sliding doors begin to open much more slowly as you approach but slam shut with an alarming suddenness as you pass, endangering your life.

Roving android mechanics start mistaking you for something that needs a quick bit of spot-welding. And even Floyd acts more strangly than normal.

Stationfall has much going for it. As well as the expected deep level of detail, fulsome prose, wide vocabulary, superb parser, and the usual high standard of Infocom packaging (a Stellar patrol patch and three pieces of bureaucratic bumph are included in addition to the items mentioned above), the adventure itself is a cracker.

There are Footnotes to read (remember Hitchhiker?) and even our old friends the Grues put in an appearance. But above all, Stationfall has the single ingredient which, with one exception, no other Infocom adventure has – Floyd!

Try to Save your game position and Floyd's eyes will light up as he exclaims, "Oh boy, are we gonna try something dangerous now?".

Attempt a Restore and Floyd looks disappointed but understanding – "That part of the story was more fun", he sighs. He has equally cheeky comments about quitting, restarting, and many other topics.

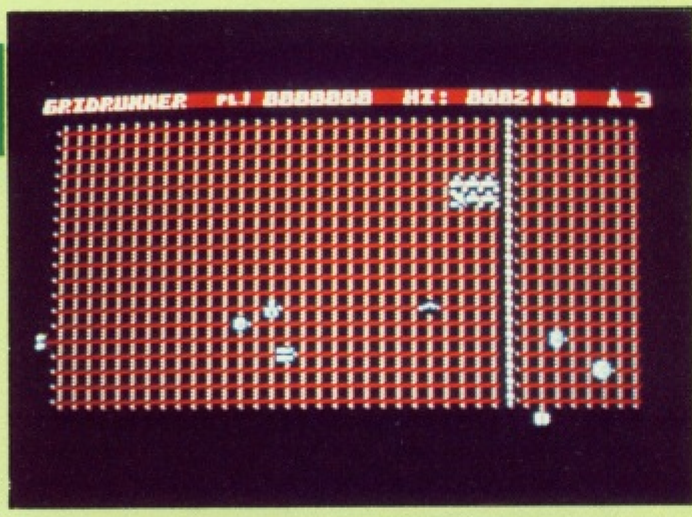
Just when you think Infocom has reached the high peak in quality and humour, leaving the rest of the competition in the dust, it ups the stakes. Stationfall is going to take some beating.

Let the last word be Floyd's. When you next go into your local computer store and spy Stationfall, heed these words, when you first clapped eyes on him in the robot pool: "Oh boy, oh boy, oh boy, pick Floyd, pick Floyd!"

Bob Chappell

Presentation	*10*
Atmosphere	*10*
Puzzlement	*10*
Value for Money	*10*
Overall	*10*

Golden oldie



Program: Gridrunner
Price: £1.99
Supplier: Mastertronic, 8-10 Paul Street, London EC2A 4JH.
Tel: 01-377 6880

HERE'S another of Jeff Minter's golden oldies. Unlike Hovver Bovver, this one belongs to the blast-em-out-of - the-universe-before-they-blast-you breed, that is the hallmark of a Minter game.

The screen is filled with a fine-mesh grid along the bottom seven lines of which your craft (the Gridrunner of the title) may move freely.

The main idea is to fire up the grid, destroying anything that moves and anything that doesn't until you've cleared the area. Fortunately, your plasma cannon has a repeat fire facility – and you'll need it.

Public enemy number one, and traversing the grid from the top at a rate of knots, are the Gridsearch Squads. These are segmented caterpillar-like droids which, on reaching one side of the grid, drop down a line and zoom back along it.

They come in assorted lengths and if the leading segment is hit, the squad is reduced by one but keeps on trucking. If any segment other than the front one is blasted, it splits into two independent squads at the point of impact.

In each case, any destroyed segment immediately turns into a pod. These lodge in the nodes of the grid and gradually change shape. When the metamorphosis is complete, they drop a bolt of energy down the grid which are fatal to your craft – a single hit will slow a pod's growth while repeated hits will destroy it.

Pods can be generated another way. Running along the X and Y axes of the grid are the Zappers. These cheerful little aliens periodically stop and hurl a plasma beam along the grid. When the two beams meet, a new pod is formed. While the Y Zapper's beam is harmful to Gridrunner's health, the X beam is lethal – both should be avojded.

When you've cleared the first grid there are another 30 to follow, each nastier and meaner than the last.

Gridrunner is a classic, a rip-roaring, noisy, mad-actioned shoot-em-up. They don't come any more frantic than this – go get it and get gridrunning.

Bob Chappell

Sound	*8*
Graphics	*7*
Playability	*9*
Value for money	*10*
Overall	*9*

Crowd puller



Program: Brian Clough's Football Fortunes
Price: £14.95 (cassette) £17.95 (disc).
Supplier: CDS Software, CDS House, Beckett Road, Doncaster DN2 4AD.
Tel: 0302 21134

ONE of the best things about Football Fortunes is that you don't have to like or understand football to enjoy it. It helps, of course, but if you enjoy Monopoly, then you should get a kick out of this one.

It is in no way an arcade type of simulation, but a computer interactive board game on the theme of soccer management, aiming for success on the field and in the bank.

The pack includes the program disc, a well designed if rather flimsy board, player cards, bank notes, counters and clearly laid out instructions.

Each player types in his name and chooses a team to manage. There is a choice of 10 First Division sides, but any other team can be nominated, even an amateur or school team.

The computer then allocates 11 player cards and two substitutes to each team, each having a nominal value of between one and five points.

Players "throw" the computer dice and move accordingly. There are possibilities for player auctions, increasing attack and defence ratings, selection problems, sponsorship, manager's luck – good and bad – loans, transfers, injuries, wage demands and so on.

The team strengths are reassessed and entered into the computer, which determines the match results. These then come through on the teleprinter, the gate money is allocated and the league table formulated.

Matches are generally decided by the team strength, but there can be upsets. As managers often say on the box: "There's nothing certain in football".

Points are allocated according to your team's position in the league, its progress through the cup competitions and money held. The winner, naturally, is the player with the most game points at the end of an agreed number of seasons.

CDS has come up with a great game and presented it really well purely as a board game, and it would lose something for being a micro-only game.

The balance achieved is just right, making for a great family game – and no crowd trouble.

Niels Reynolds

Graphics	*6*
Playability	*7*
Value for Money	*7*
Overall	*8*

Mixed bag



Program: Four Star Compilation, Volume 1
Price: £7.95 (cassette) £9.95 (disc)
Supplier: Red Rat, 11 Fennel Street, Manchester M4 3DU.
Tel: 061-835 1055

FOLLOWING their successes with Crumble's Crisis, Space Lobsters and Astro-Droid, Red Rat has decided to jump on to the compilation bandwagon with a collection of four earlier games: Escape from Doomworld, Panic Express, Domain of the Undead and Laser Hawk.

Escape from Doomworld involves you in a mission to save a team of scientists from a planet about to attack Earth.

Game-play is divided into a platform game, a flying shoot-em-up and a bombing run. The platform section has you leaping over Dalek-like robots and electric pulses in order to collect canisters of air, a rocket and a small block marked GO.

Once you have mastered this section you are taken into a game which reminded me of Choplifter. Avoiding enemy fighters and collecting fuel along the way, you must rescue the 12 scientists, returning them to your starting position.

Though not spectacular the graphics and sound are adequate. Although the controls take getting used to I found Escape from Doomworld had an addictive quality and well worth playing.

Panic Express is well named – the train is out of control and you must get to the engine to stop it. Leaping over carriages and avoiding balloons, lightning bolts, laser grids and shark-infested pools you reach your goal.

A note of warning – take care over the last three screens, it took me nearly three hours to get through these to the engine. "Well done: you stopped the train" is the final message – and an anticlimax. Once completed it is not a game I would return to.

Laser Hawk is completely different and as enjoyable now as when I first played it. Great graphics and appropriate sound.

The evil forces of Proc Irata have attacked and you are chosen to launch the counter attack using the most advanced helicopter available – Laser Hawk.

The plan is simple – destroy everything. Points are awarded for blasting buildings and enemy fightercraft while avoiding missiles and lava eruptions.

This is a shoot-em-up pure and simple. It's the best game of the compilation and it soon converted me to a shoot-em-up fan.

Domain of the Undead is disappointing, attempting to be a clone of the arcade Ghosts 'n' Goblins, it fails miserably.

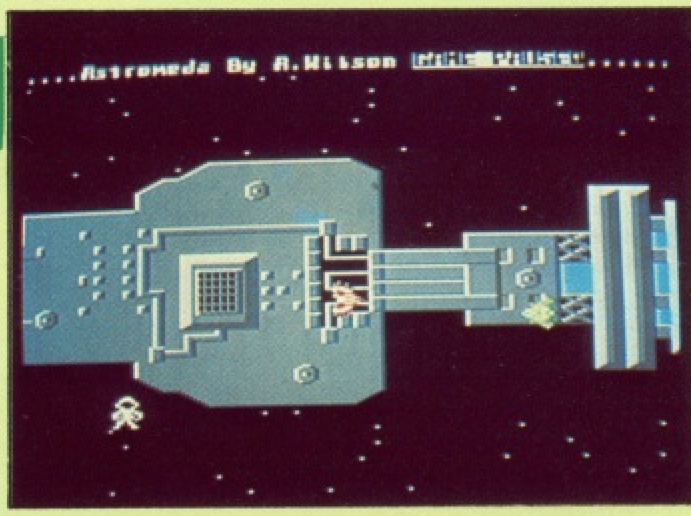
With appalling graphics, sparse sound and difficult gameplay you make your way through a haunted graveyard. With four crucifixes and a gun for protection against evil spooks, ghouls, skeletons and bats, you tour the area.

Despite Domain of the Undead, this compilation is very good – a good buy if only for Laser Hawk. I am waiting for volume two.

Robert Swan

Sound	7
Graphics	8
Playability	7
Value for money	8
Overall	8

Fast and furious



Program: Astromeda
Price: £1.99
Supplier: Budgie Software, Rino Marketing, 1 Orange Street, Sheffield S1 4DW.
Tel: 0742 755796

IT may be another space shoot-em-up, but this one makes up in slick graphics and smooth, fast action what it lacks in originality.

Those pesky aliens are at it again – they are about to destroy Starbase Astromeda. Many of your fellow astronauts have been cast adrift in space and it is your task to pick them all up.

While you're about it, you must avoid deadly meteorites and annihilate the marauding alien hordes on your way to smashing their mother ship. And all this before breakfast and with one hand tied behind your back, I suppose?

The game shows an overhead view of a 10 screen-wide playing area, set against black and starry heavens. You pilot your twin-cannoned craft from left to right while the scenery scrolls smartly and smoothly to the east.

In front of the backdrop is a huge and impressive grey, metallic-looking ship, presumably the mother ship. I can't say for sure because I never completed the 10 screens.

When you see the number and speed of the aliens and meteorites coming at you from the right, perhaps you, too, will have a few problems making it through to the climax. Don't forget that you're supposed to pick up your compatriots as they free-fall past your portholes.

There are 10 types of aliens but you do have the capability of dropping one of your wipe-out bombs when the going gets rough. Trouble is, they don't come cheap – you have to amass 10,000 points to get another. You'll also get an extra life with every 10,000 points as well.

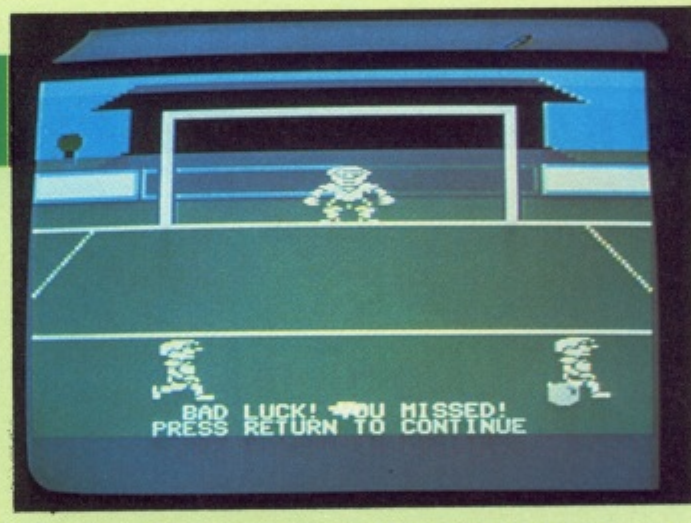
The game is for play with joysticks only. Sound effects are pretty good and complement the clean graphics, making a nicely polished product.

One of the better space arcade games around and at a budget price, too. Astromeda is well worth a whirl.

Bob Chappell

Sound	8
Graphics	9
Playability	8
Value for money	9
Overall	9

Penalty box



Program: Footballer of the Year
Price: £8.95
Supplier: Gremlin Graphics, Alpha House, 10 Carver Street, Sheffield S1 4FS.
Tel: 0742 753243

ALREADY released on other formats, Footballer of the Year now makes its debut on the Atari.

As a young 17-year-old apprentice footballer you start your career. With a set amount of money and a choice of division and club you make your debut.

You have a set number of goal cards. By using one of them in a game you are given the chance to score goals and increase your season's tally. Sometimes your card will present you with a penalty with the chance to score without any hassle, otherwise you get two defenders rushing at you.

Usually you are given three or four chances a match to score and the final score appears teletype fashion. After the game, you are able to assess the league data including your position this season (goals for the national team, in the FA Cup, League Cup and in the League).

You can change your financial picture by using an Incident Card. You may win on the roulette table or break a leg for instance. Transfer Cards can also be bought, the price depending on which division you are playing in. If the talent-scout is not interested you have wasted your money.

Almost everything is text and the poor graphics are all monochrome on an unchanging background. I was disappointed too, by the lack of sound – the occasional cheer would have been nice.

The transfer procedure is ridiculous: With a rating of Excellent, in the First Division, and with over 100 goals scored after two seasons I was turned down by a Third Division scout looking for an average player.

Footballer of the Year is quite addictive, but a little too easy to score goals and to get a high rank. At £8.95 I found it overpriced.

Robert Swan

Sound	*n/a*
Graphics	*6*
Playability	*7*
Value for Money	*5*
Overall	*7*

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Your HINTS & TIPS

Spellbound

HERE are some tips for Spellbound. To light the candle, take it and cast Candelabrum Illuminatus. The candle can then be used to read the Ancient Scrolls.

On the ground floor, stand on the yellow puddle and cast Armoris Photonicus to make your armour glow. This means that you can drop the glowing bottle and release the Banshee. Command it to help for hints. Use the broken glass to read the writing on the candle.

Give the javelin to Samson and summon him to the pit. Command him to help and he will place a useful platform in the pit for you to use.

To mend the broken Talisman, give it and the tube of glue to Florin and command him to help.

To release Gimbal is complicated, but here goes...

Take the three coloured crystals (red, green and blue) and the white gold ring. Give the Book of Shadows to Orik the Cleric and summon him to the Most Magic Room where Gimbal is trapped.

Holding the ring, the three crystals and the mended Talisman, go to the Most Magic Room and cast the Crystallium Spectralis spell and throw the crystals at Gimbal in any order to release him.

Cast the Release spell and he'll be ready to send the characters home. – *Mark Powell, Lewes, East Sussex.*

One Man and his Droid

IN the February 1987 issue of *Atari User* Colin Raynor gave you the first eight level passwords for One Man and his Droid. Well, here are all 20 of them.

Not Applicable	Seaside
Bubble	Gizmo
Atari	King Kong
Finders	Hologram
Genetic	Curry Rice
Zapped	Coffee
Megasonic	Cassette
Time Warp	Telescope
Ectoplasm	Computer
Gorgeous	Edacraeda

– *Nicky Alford, Stourbridge, West Midlands.*

WarHawk

WHEN you get to the fourth screen a flashing spacecraft will appear. If you fire at it once you will find that it changes shape. You can now dock with it. When you do this press fire once and you will now have rapid fire. – *Richard Hider, Havant, Hants.*

Racing Destruction Set

WHEN you design a track the best area to lay a landmine or oil is on a slope or on the ice patches. The best car to choose when playing the game is the fastest, lightest jeep you can get (but not too light – get some weapons and shielding).

If you are driving on paved surfaces with no hazards go for the racing car. If there are a lot of slopes use the street bike. It is possible with a little luck to do a three point turn and go back the way you came. – *Patrick Marshall, Harbrough, South Humberside.*

Zorro

WHEN you come to the bell tower jump from the end of the roof and keep Zorro jumping. He will then jump the gap between the door and the roof. Don't forget to collect the key near the sofa – *Stephen Buxton, Normanby, Cleveland.*

Starquake

WHEN you enter the transports in Starquake use the following codes to move to various areas of the game:

Cosec	Triad
Kernx	Atari
Whole	Penta
Minim	Artic
Crash	Salco

– *Stephen Banks, Upminster, Essex.*

Spy Vs Spy II

IT is possible to lay traps round the base of trees and also put up a tree snare. This allows you to trap your opponent, and when he is let down he will land on a trap. The best one for him to land on is a bomb. – *Sue Bowling, Henbury, Cheshire.*

Gauntlet

ARE you having trouble with the poisoned food in Gauntlet? The answer is easy. Take a look at the food before you collect it and if the handle is square then the food is safe. If it is triangular the bottles contain poisoned food. – *Steven Robb, Central Region, Scotland.*

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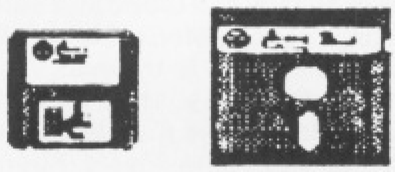
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Dos discs at your fingertips

Part 8 of ANDRÉ WILLEY's series on the Atari's input/output facilities

FOR the last two months we have been examining the workings of Dos 2.0 and Dos 2.5, and perhaps some of you will have become a little daunted by the complexity of the bit-mapped data storage system used in order to save space on the disc.

This system of using all eight bits within each byte to represent separate items of information is actually quite simple, but calculating the results can prove long and laborious. If you have tried Bruce Woodland's disc sector editor from the last issue you will have noticed just how incomprehensible some of the data looks.

For those who would like to have a go at modifying the disc format but who don't feel up to working out all the numbers then DISCVIEW is for you. Type it in exactly as shown, and save a copy to disc. You can use the Get It Right! checksum program to be sure you haven't made any mistakes. Watch especially for the DATA statements starting at line 21200.

When you run the program it will take a few moments to set up some strings and other variables before presenting the main menu where selections are single-key entry so you don't need to press Return. Each selection lets you examine or edit different portions of the disc, and each has its own set of commands:

D) View/Edit Directory: The eight directory sectors will be read into memory in one operation and you may then scroll through the 64 entries by using the cursor up and down arrow keys. If you hold down Control with these keys the selection will move forwards or backwards by four entries.

The screen will also show the surrounding 8 file entries, with an arrow pointing to the current selection. The various bit-mapped information bytes are decoded at the bottom of the screen. Typing N or E will allow you to change the name or extender while S and T will accept new values for the First Sector and Total Sector Count items, respectively. If you make a mistake in entering any of these you will be asked to re-enter the item. The file information flags shown on the right may be toggled on and off as indicated on the screen menu.

Enter W to write the modified directory to disc, and Escape or Q to quit and return to the main menu.

V) View/Edit Volume Table of Contents: This will read the VTOC sector(s) containing the map of free disc space and allow you to view or modify it. If the disc is in enhanced density then the two VTOC sectors will be combined by DISCVIEW and displayed as one table for your convenience.

Use the cursor keys to move the cursor around the table – hold down Control to move five spaces at a time. You may also use the N and B keys to go on to the next sector or back to the last one. The number of the one you are currently viewing will be displayed at the bottom of the screen, along with the current free sector count. Pressing the spacebar will toggle a sector between being in-use and free.

Enter W to write the VTOC back to the disc, and Escape or Q to quit and return to the main menu.

S) View/Edit Sector Links: This section of the program will allow you to view any sector on the disc, and perhaps alter its forward reference information contained within the last three bytes. If you wish to edit the actual data portion of the sector then you should use Bruce Woodland's program from the August issue of *Atari User* since DISCVIEW was not designed for this purpose.

Once a sector has been displayed you may use the B, F or O keys to input new values for the Byte count, File number or Next sector pointer respectively. The file number should always be the same as that given by the Directory View/Edit section or you will get a 164 error when attempting to access the file from Dos.

You may continue to the next logical sector (following the next sector pointer value wherever possible) by pressing C, but this will not write any modified data back to the disc. Use W for write if you wish to save the data before continuing. Be careful of using the sector write option unless you are sure of your modifications because it does not prompt you before updating the disc. Q or Escape will simply quit the current edit and take you back to the main menu.

B) View/Edit boot sector: The first sector on a Dos 2.0/2.5 disc contains important information about the way Dos will perform. Much of this is not user-alterable, but you may toggle the active drive allocation values by pressing keys 1 to 8 accordingly. Pressing B will allow you to change the number of disc file buffers to be used.

Once again, you may then use W to write the sector back again, and Q or Escape to quit back to the menu.

C) Change drive number: This simply allows you to enter a new drive number (between one and four). The disc in the new drive will then be checked and you will be warned if it is not in the correct format. All future operations will then take place using this new disc drive.

E) Exit: This will halt the program and return you to Basic. Pressing Q or Escape from the main menu will also exit the program.

DISCVIEW is certainly not the final answer to disc editing – but at least it will allow you to examine the way that Dos works without getting too much of a headache trying to sort out the numbers. As with all programs of this nature, don't forget to only view and edit a backup of your data disc or a wrong keypress could end up ruining hours of work in error.

Well, this concludes our tour through the CIO and disc handler systems, but in a future issue I'll take a deeper look into the operating system to reveal how the Serial Input/Output (or SIO) routines transfer your data to the various peripherals.

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◀ From Page 23

MAIN VARIABLES

BUFIN$	Input sector buffer
BUFOUT$	Output sector buffer
VTOC$	Full length VTOC table (combines sectors 360 and 1024)
BINAND$	Binary AND machine code routine
BINOR$	Binary OR machine code routine
GSECT$	Get-sector machine code routine
PSECT$	Put-sector machine code routine
CAT$	Full directory information (from sectors 361-368)
HX$	Hex digits 0-F
F$	Temporary filename storage
ESC$, D$, C$, B$, UL$	Strings containing special print characters
TYPE	18 or 26 sectors per track (single/enhanced density)
FREE1	Number of free sectors between 1 and 719
FREE2	Number of free sectors between 720 and 1023
FREE	Total number of free sectors
SECT	Current working sector number
PMBASE	PMG base address
POS0	Register address for Player 0 horizontal position
CH	Keyboard character store
ERR	Status flag for sector I/O routines (1 = OK)
FILE	Current directory entry number

PROGRAM BREAKDOWN

10-500	Memory check
2000-2180	Draw VTOC map on Graphics 15 screen
2200-2240	Move PMG cursor to new position
2300-2370	Print VTOC sector information
2500-2730	Calculate VTOC and write to disc
3000-3550	View/Edit VTOC (Main routine)
4000-4690	View/Edit Directory (Main routine)
4700-4750	Input new sector number
4800-4850	Modify directory entry flag byte
4900-4980	Input new filename/extension
5000-5470	View/Edit boot sector (Main routine)
5600-5650	Input new active drive details
5700-5730	Input new buffer allocation
5800-5830	Write boot sector to disc
5900-5950	Print four digit hex number
6000-6400	View/Edit sector link data (Main routine)
6500-6570	Enter new value for sector link data
6600-6630	Write sector to disc and move to next logical sector
10000-10020	General read sector routine
10100-10120	General write sector routine
10200-10230	Pause for error message, then return
10300-10340	Check for valid Dos 2.0/2.5 disc and detect density
11000-12105	Plot numerals/text on Graphics 15 screen (for VTOC)
20000-20220	Main menu routine
21000-21250	Initialise variables, machine code strings, PMG, and so on

```
1 REM DISC VIEWER
2 REM BY ANDRE WILLEY
3 REM (c)ATARI USER
10 IF FRE(0)<12910 THEN ? "NOT ENOUGH
MEMORY":END
20 DIM BUFIN$(128),BUFOUT$(128),VTOC$(
130),BINAND$(16),BINOR$(16),TEXT$(4),G
SECT$(44),PSECT$(44),CAT$(1024)
30 DIM HX$(16),ESC$(1),D$(1),C$(1),B$(
1),UL$(40),PR$(39),F$(10)
50 M=PEEK(106):POKE 106,M-16:PMBASE=(M
-8)*256
60 GRAPHICS 0:POKE 752,1:POSITION 15,1
0:? "INITIALISING"
70 GOSUB 21000
80 OPEN #1,4,0,"K:"
500 GOTO 20000
2000 REM DISPLAY SECTOR MAP DATA
2010 ? D$;"    *** CALCULATING SECTOR
DATA ***";:COLOR 1:PLOT XB,YB:DRAWTO X
B,YB+(5*TYPE)
2015 COLOR 2:SECT=0:S=0:T=0:FOR I=1 TO
 (MAX+1)/8:J=128
2020 Z=USR(BINAND,J,ASC(VTOC$(I,I)))
2030 IF Z>0 OR S=0 THEN 2100
2040 X=XB+(T*3)+1:Y=YB+(S*5)-4
2050 PLOT X,Y:DRAWTO X,Y+3:PLOT X+1,Y:
DRAWTO X+1,Y+3
2060 IF SECT>719 THEN FREE2=FREE2-1
2070 IF SECT<720 THEN FREE1=FREE1-1
2100 SECT=SECT+1:S=S+1:IF S>TYPE THEN
S=1:T=T+1:COLOR 1:PLOT XB+(T*3),YB:DRA
WTO XB+(T*3),YB+(5*TYPE):COLOR 2
2110 IF J>1 THEN J=J/2:GOTO 2020
2120 NEXT I:FREE=FREE1+FREE2
2130 X1=XB+118:X2=XB+119:Y1=YB+(TYPE*5
):Y2=YB+(TYPE*5)-4:IF TYPE=26 THEN Y2=
YB+45
2140 COLOR 1:PLOT X1,Y1:DRAWTO X1,Y2:P
LOT X2,Y1:DRAWTO X2,Y2:PLOT XB+120,YB:
DRAWTO XB+120,YB+(5*TYPE)
2150 FOR Y=YB TO YB+(5*TYPE) STEP 5
2160 PLOT XB,Y:DRAWTO XB+120,Y
2170 NEXT Y
2180 RETURN
2200 REM POSITION PMG BASED ON S & T
2210 FOR I=OLD TO OLD+5:POKE I,0:NEXT
I:OLD=STY+(S-1)*5
2220 POKE OLD,240:POKE OLD+1,144:POKE
OLD+2,144:POKE OLD+3,144:POKE OLD+4,14
4:POKE OLD+5,240
2230 POKE POS0,STX+(T)*3
2240 RETURN
2300 REM DISPLAY SECTOR CONTENTS
2301 SECT=T*TYPE+S
2302 TEXT$=STR$(SECT):PR$(11,14)="
":PR$(15-LEN(TEXT$),14)=TEXT$
2310 X=XB+(T*3)+1:Y=YB+(S*5)-4
2320 LOCATE X,Y,DAT
2330 IF DAT=0 THEN PR$(16,21)="EMPTY "
2340 IF DAT=1 THEN PR$(16,21)="HIDDEN"
2350 IF DAT=2 THEN PR$(16,21)="IN USE"
2360 TEXT$=STR$(FREE):PR$(26,30)="
 ":PR$(31-LEN(TEXT$),30)=TEXT$:PR$(30-
LEN(TEXT$),30-LEN(TEXT$))="("
2370 ? D$;PR$;:RETURN
2500 REM WRITE VTOC BACK TO DISK
2510 POKE POS0,0:? D$;"   *** CALCULAT
ING: PLEASE WAIT ***";
2520 VTOC$(1)=CHR$(0):VTOC$(130)=CHR$(
0):VTOC$(2)=VTOC$:BUFIN$=VTOC$:BUFOUT$
=VTOC$
2530 S=0:T=0:FOR I=1 TO (MAX+1)/8:J=12
8
2540 X=XB+(T*3)+1:Y=YB+(S*5)-4
2550 LOCATE X,Y,DAT
2560 IF DAT=0 AND S>0 THEN Z=USR(BINOR
,J,ASC(VTOC$(I,I))):VTOC$(I,I)=CHR$(Z)
```

```
2570 S=S+1:IF S>TYPE THEN S=1:T=T+1
2580 IF J>1 THEN J=J/2:GOTO 2540
2590 NEXT I
2600 I=ADR(BUFOUT$):POKE I,2
2610 IF TYPE=18 THEN POKE I+1,195:POKE
 I+2,2
2620 IF TYPE=26 THEN POKE I+1,242:POKE
 I+4,2
2630 POKE I+3,USR(BINAND,FREE1,255)
2640 POKE I+4,FREE1/256
2650 BUFOUT$(11,100)=VTOC$(1,90)
2660 I=ADR(BUFIN$)
2670 BUFIN$(1,122)=VTOC$(7,128)
2680 POKE I+122,USR(BINAND,FREE2,255)
2690 POKE I+123,FREE2/256
2700 SECT=360:GOSUB 10100:IF ERR<>1 TH
EN ? D$;"  *** DISK WRITE ERROR: SECT
360 ***";:GOSUB 10200:GOTO 20000
2710 BUFOUT$=BUFIN$
2720 SECT=1024:GOSUB 10100:IF ERR<>1 T
HEN ? D$;"  *** DISK WRITE ERROR: SECT
 1024 ***";:GOSUB 10200
2730 GOTO 20000
3000 REM DISPLAY/EDIT VTOC
3010 GRAPHICS 15:POKE 559,58:POKE 752,
1:SETCOLOR 2,0,0:SETCOLOR 0,8,6:SETCOL
OR 1,8,10
3020 COLOR 1:MAX=719:POKE 82,3
3030 PRINT C$:? "    DISK VOLUME TABLE
 OF CONTENTS":? "    ";UL$(1,29):? "
      *** PLEASE WAIT ***";
3040 PR$="   SECTOR 0000 HIDDEN    (00
00 FREE)"
3050 GOSUB 10300
3070 VTOC$(1,90)=BUFIN$(11,100)
3080 FREE1=719:FREE2=0:SECT=1024:GOSUB
 10000:IF ERR<>1 THEN 3100
3090 MAX=1023:FREE2=304:VTOC$(91,128)=
BUFIN$(85,122)
3100 XB=25:YB=27:IF TYPE=18 THEN YB=40
3160 STY=PMBASE+1056+YB:STX=73:COLOR 2
:IF OLD=0 THEN OLD=STY
3170 Y=YB-23:X=XB+50:GOSUB 12000
3180 X=8:Y=YB-28+TYPE*3:GOSUB 12100
3190 Y=YB-4:I=0:FOR X=XB+1 TO XB+120 S
TEP 15
3200 IF I>9 THEN Y=Y-8:GOSUB 11000+(IN
T(I/10)*10):Y=Y+8
3210 GOSUB 11000+((I-INT(I/10)*10)*10)
:I=I+5
3230 NEXT X
3240 X=X-3:GOSUB 11090:Y=Y-8:GOSUB 110
30
3250 X=XB-5:Y=YB+5:GOSUB 11010
3260 I=5:FOR Y=YB+25 TO YB+(5*TYPE) ST
EP 25
3270 IF I>9 THEN X=X-4:GOSUB 11000+(IN
T(I/10)*10):X=X+4
3280 GOSUB 11000+((I-INT(I/10)*10)*10)
:I=I+5
3290 NEXT Y
3300 POKE 82,2:GOSUB 2000
3320 S=1:T=0:GOSUB 2200:GOSUB 2300
3330 GET #1,CH
3340 IF CH=27 THEN POKE POS0,0:GOTO 20
000
3350 IF CH=32 THEN GOSUB 3500
3360 IF CH=45 AND S>1 THEN S=S-1
3370 IF CH=61 AND S<TYPE THEN S=S+1
3380 IF CH=43 AND T>0 THEN T=T-1
3390 IF CH=42 AND T<39 THEN T=T+1
3400 IF CH=28 THEN S=S-5:IF S<1 THEN S
=1
3410 IF CH=29 THEN S=S+5:IF S>TYPE THE
N S=TYPE
3420 IF CH=30 THEN T=T-5:IF T<0 THEN T
=0
3430 IF CH=31 THEN T=T+5:IF T>39 THEN
T=39
3440 IF CH=78 THEN S=S+1:IF S>TYPE THE
N S=1:T=T+1:IF T>39 THEN T=0
3450 IF CH=66 THEN S=S-1:IF S<1 THEN S
=TYPE:T=T-1:IF T<0 THEN T=39
3460 IF CH<>87 THEN 3490
3470 PRINT D$;"  WARNING!! WRITE VTOC
TO DISK? (Y/N)";
3480 POKE 702,64:POKE 694,0:GET #1,CH:
IF CH=89 THEN 2500
3490 GOSUB 2200:GOSUB 2300:GOTO 3330
3500 IF DAT=1 THEN RETURN
3510 COLOR 2-DAT
3520 IF S+(TYPE*T)>719 THEN FREE2=FREE
2+DAT-1
3530 IF S+(TYPE*T)<720 THEN FREE1=FREE
1+DAT-1
3540 FREE=FREE1+FREE2
3550 PLOT X,Y:DRAWTO X,Y+3:PLOT X+1,Y:
DRAWTO X+1,Y+3:RETURN
4000 REM EDIT DIRECTORY DATA
4010 ? C$:SETCOLOR 2,7,4:SETCOLOR 4,7,
6:CH=0
4020 ? "          DIRECTORY VIEW/EDIT":
? "          ";UL$(1,19):? :? :GOSUB 10
300
4100 FOR I=0 TO 7
4110 SECT=I+361:GOSUB 10000:IF ERR<>1
THEN ? "  *** DISK READ ERROR: SECT ";
I+361;" ***":GOSUB 10200:GOTO 20000
4120 CAT$((I*128)+1,(I+1)*128)=BUFIN$(
1,128)
4130 NEXT I:FILE=0:GOTO 4200
4150 REM WRITE DIRECTORY BACK TO DISK
4160 FOR I=0 TO 7
4170 BUFOUT$(1,128)=CAT$((I*128)+1,(I+
1)*128):SECT=I+361
4180 GOSUB 10100:IF ERR<>1 THEN ? D$;"
 *** DISK WRITE ERROR: SECT ";I+361;"
***":GOSUB 10200:GOTO 20000
4190 NEXT I:GOTO 20000
4200 REM PRINT 9  ENTRIES ON SCREEN
4210 FOR I=FILE-4 TO FILE-1
4220 IF I>=0 THEN POSITION 14,I+8-FILE
:? CAT$((I*16)+6,(I*16)+13);"  ";CAT$(
(I*16)+14,(I*16)+16)
4230 IF I<0 THEN POSITION 14,I+8-FILE:
? "              "
4240 NEXT I:POSITION 3,9:? "File ";FIL
E;"  "
4250 POSITION 11,9:? "-> ";CAT$((FILE*
16)+6,(FILE*16)+13);"  ";CAT$((FILE*16
)+14,(FILE*16)+16);" <-"
4260 FOR I=FILE+1 TO FILE+4
4270 IF I<=63 THEN POSITION 14,I+10-FI
LE:? CAT$((I*16)+6,(I*16)+13);"  ";CAT
$((I*16)+14,(I*16)+16)
4280 IF I>63 THEN POSITION 14,I+10-FIL
E:? "              "
4290 NEXT I:POSITION 1,15:FOR I=1 TO 3
8:? CHR$(18);:NEXT I
4300 Y=16:I=FILE*16+1:DAT=ASC(CAT$(I))
:POSITION 1,Y:? "N.Name: ";CAT$(I+5,I+
12)
4310 POSITION 1,Y+1:? "E.Ext:  ";CAT$(
I+13,I+15)
4320 POSITION 1,Y+2:? "F.First Sect:
";;ASC(CAT$(I+3))+ASC(CAT$(I+4))*256;"
 "
4330 POSITION 1,Y+3:? "T.Total Sects:
";;ASC(CAT$(I+1))+ASC(CAT$(I+2))*256;"
 "
4340 POSITION 21,Y:? "O.Open for write
:";CHR$((USR(BINAND,DAT,1)>0)*11+78)
4350 POSITION 21,Y+1:? "2.DOS 2 file:
   ";CHR$((USR(BINAND,DAT,2)>0)*11+78)
4360 POSITION 21,Y+2:? "I.Entry in use
:  ";CHR$((USR(BINAND,DAT,64)>0)*11+78
)
4370 POSITION 21,Y+3:? "D.Deleted:
    ";CHR$((USR(BINAND,DAT,128)>0)*11+7
8)
4380 POSITION 1,Y+4:? D$;D$;D$;:IF USR
(BINAND,DAT,67)=3 THEN POSITION 1,Y+4:
? "Dos 2.0 hidden"
4390 POSITION 21,Y+4:? "L.Locked:
   ";CHR$((USR(BINAND,DAT,32)>0)*11+78
)
4400 ? :? "Select from above or W)rite
 or Q)uit";
4500 POKE 694,0:POKE 702,64:GET #1,CH
4510 IF CH=28 THEN FILE=FILE-4:IF FILE
<0 THEN FILE=0
4520 IF CH=29 THEN FILE=FILE+4:IF FILE
>63 THEN FILE=63
4530 IF CH=45 THEN FILE=FILE-1:IF FILE
<0 THEN FILE=0
4540 IF CH=61 THEN FILE=FILE+1:IF FILE
>63 THEN FILE=63
4550 IF CH=27 OR CH=81 THEN 20000
4560 IF CH=79 OR CH=48 THEN X=1:GOSUB
4800
4570 IF CH=50 THEN X=2:GOSUB 4800
4580 IF CH=73 THEN X=64:GOSUB 4800
4590 IF CH=76 THEN X=32:GOSUB 4800
4600 IF CH=68 THEN X=128:GOSUB 4800
4610 IF CH=70 THEN X=3:GOSUB 4700
4620 IF CH=84 THEN X=1:GOSUB 4700
4630 IF CH=78 THEN X=5:GOSUB 4900
4640 IF CH=69 THEN X=13:GOSUB 4900
4650 IF CH<>87 THEN 4690
4660 PRINT D$;" WRITE NEW DIRECTORY TO
 DISK? (Y/N)";
4670 POKE 702,64:POKE 694,0:GET #1,CH:
IF CH=89 THEN 4150
4690 POSITION 0,22:? D$:GOTO 4200
4700 REM ENTER NEW SECTOR NUMBERS
4710 POSITION 0,22:? D$;"    Enter new
 ";:IF X=1 THEN ? "sector count ";
4720 IF X=3 THEN ? "first sector ";
4730 POKE 752,0:TRAP 4740:Y=0:INPUT Y
4740 POKE 752,1:IF Y<>INT(Y) OR Y<1 OR
 Y>1023 OR (Y>719 AND TYPE=18) THEN ?
B$;:GOTO 4710
4750 TRAP 40000:CAT$(I+X,I+X)=CHR$(USR
(BINAND,Y,255)):CAT$(I+X+1,I+X+1)=CHR$
(INT(Y/256)):RETURN
4800 REM TOGGLE BIT PATTEN
4810 Y=USR(BINAND,DAT,X)
4820 IF Y=0 THEN DAT=DAT+X
4830 IF Y>0 THEN DAT=DAT-X
4840 CAT$(I,I)=CHR$(DAT)
4850 RETURN
4900 REM ENTER NEW FILENAME
4910 POSITION 0,22:? D$;"    Enter new
 ";:IF X=5 THEN ? "filename ";
4920 IF X=13 THEN ? "extender ";
4930 POKE 752,0:TRAP 4940:INPUT F$
4940 POKE 752,1:IF LEN(F$)=0 OR LEN(F$
)>8 OR (LEN(F$)>3 AND X=13) THEN ? B$;
:GOTO 4910
4950 TRAP 40000:FOR X2=LEN(F$)+1 TO 8:
F$(X2,X2)=" ":NEXT X2
4960 IF X=13 THEN CAT$(I+X,I+X+2)=F$(1
,3)
4970 IF X=5 THEN CAT$(I+X,I+X+7)=F$(1,
8)
4980 RETURN
5000 REM DISPLAY/EDIT BOOT SECTOR
5010 ? C$:SETCOLOR 2,3,4:SETCOLOR 4,2,
6:CH=0
5020 POSITION 4,0:? "DISK BOOT INFORMA
TION (SECTOR 1)":? "  ";UL$(1,32):GOSU
B 10300
5030 SECT=1:GOSUB 10000:IF ERR<>1 THEN
 ? :? "          *** DISK READ ERROR ***
";:GOSUB 10200:GOTO 20000
```

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```
5100 I=ADR(BUFIN$):POKE 82,4:POSITION 4,2
5110 ? "Boot Flag .............. ";PEEK(I)
5120 ? "No. of boot sectors .... ";PEEK(I+1)
5130 ? "Boot load address ...... ";:X1=PEEK(I+2):X2=PEEK(I+3):GOSUB 5900:?
5140 ? "Boot INIT address ...... ";:X1=PEEK(I+4):X2=PEEK(I+5):GOSUB 5900:?
5150 ? "Boot Continue vector ... JMP ";:X1=PEEK(I+7):X2=PEEK(I+8):GOSUB 5900:?
5160 POSITION 4,7:? "No. of active buffers .. ";PEEK(I+9);"  ":IF CH>0 THEN 5300
5240 ? "Address of buffers ..... ";:X1=PEEK(I+12):X2=PEEK(I+13):GOSUB 5900:?
5250 ? "DOS present/Sector size. ";:IF PEEK(I+14)=0 THEN ? "No":GOTO 5270
5260 ? "Yes (";PEEK(I+14)*128;")"
5270 ? "1st sector of DOS.SYS .. ";PEEK(I+15)+PEEK(I+16)*256;"  "
5280 ? "Address for DOS.SYS .... ";:X1=PEEK(I+18):X2=PEEK(I+19):GOSUB 5900:?
5290 ? "Offset to sector link .. ";PEEK(I+17);"  "
5300 POSITION 4,13:FOR X=0 TO 7
5310 ? "Drive ";X+1;" active? ........ ";
5320 DAT=USR(BINAND,PEEK(I+10),INT(2^X+0.5))
5330 IF DAT>0 THEN ? "Yes"
5340 IF DAT=0 THEN ? "No "
5350 NEXT X
5400 POSITION 4,22:? "Select: Drives (1-8), B)uffers,"
5410 ? "        W)rite to disk or Q)uit";
5420 POKE 694,0:POKE 702,64:GET #1,CH
5430 IF CH=81 OR CH=27 THEN 20000
5440 IF CH=87 THEN 5800
5450 IF CH=66 THEN 5700
5460 IF CH>48 AND CH<57 THEN 5600
5470 ? B$;:GOTO 5420
5600 REM CHANGE ACTIVE DRIVE STATUS
5610 CH=INT(2^(CH-49)+0.5)
5620 DAT=USR(BINAND,PEEK(I+10),CH)
5630 IF DAT=0 THEN POKE I+10,PEEK(I+10)+CH
5640 IF DAT>0 THEN POKE I+10,PEEK(I+10)-CH
5650 POSITION 0,22:? D$;D$:GOTO 5160
5700 REM CHANGE NUMBER OF BUFFERS
5710 POKE 752,0:POSITION 0,22:? D$;D$;"How many buffers (1-255) ";:TRAP 5720:DAT=0:INPUT DAT
5720 POKE 752,1:IF DAT>255 OR DAT<1 OR DAT<>INT(DAT) THEN ? B$;:GOTO 5710
5730 TRAP 40000:POKE I+9,DAT:POSITION 0,22:? D$:GOTO 5160
5800 REM WRITE BOOT SECTOR TO DISK
5810 BUFOUT$=BUFIN$:SECT=1:GOSUB 10100
5820 IF ERR<>1 THEN POSITION 0,22:? D$;D$;"   *** DISK WRITE ERROR ***";:GOSUB 10200
5830 GOTO 20000
5900 REM PRINT HEX FROM X1(LO),X2(HI)
5910 ? "$";:DAT=INT(X2/16)+1:? HX$(DAT,DAT);
5920 DAT=(USR(BINAND,X2,15))+1:? HX$(DAT,DAT);
5930 DAT=INT(X1/16)+1:? HX$(DAT,DAT);
5940 DAT=(USR(BINAND,X1,15))+1:? HX$(DAT,DAT);
5950 RETURN
6000 REM VIEW/EDIT SECTOR LINKS
6010 ? C$:SETCOLOR 2,14,4:SETCOLOR 4,14,6:? "          SECTOR LINK EDITOR":? "          ";UL$(1,18)
6020 POSITION 0,6:? D$;"        Enter sector number";
6030 TRAP 6040:SECT=0:INPUT SECT
6040 IF SECT<1 OR SECT<>INT(SECT) OR SECT>1023 OR (SECT>719 AND TYPE=18) THEN ? B$;:GOTO 6020
6050 TRAP 40000:POSITION 5,6:? D$
6060 ? :GOSUB 10000:IF ERR<>1 THEN ? "   *** ERROR READING SECTOR ";SECT;" ***";:GOSUB 10200:GOTO 20000
6100 POKE 82,12:POSITION 2,3
6110 FOR Y=0 TO 7
6120 ? :FOR X=1 TO 16
6130 I=ASC(BUFIN$(Y*16+X,Y*16+X)):IF I=155 THEN I=27
6140 ? ESC$;CHR$(I);
6150 NEXT X
6160 NEXT Y
6170 ? :? :? "   SECTOR ";SECT;"   "
6180 POKE 82,0
6200 POSITION 5,15:? "Bytes used this sector .. ";USR(BINAND,ASC(BUFIN$(128,128)),127);"  "
6210 POSITION 5,16:? "File reference number ... ";USR(BINAND,ASC(BUFIN$(126,126)),252)/4;"  "
6220 POSITION 5,17:? "Next sector number ...... ";:I=USR(BINAND,ASC(BUFIN$(126,126)),3)*256+ASC(BUFIN$(127,127))
6230 IF I>0 THEN ? I;"  "
6240 IF I=0 THEN ? "EOF":I=SECT+1
6250 POSITION 3,20:? "Select B, F or N to alter values,":? "          W)rite, C)ontinue or Q)uit"
6300 POKE 694,0:POKE 702,64:GET #1,CH:POSITION 3,20:? D$;D$
```

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```
6310 IF CH=81 OR CH=27 THEN 20000
6320 IF CH=67 THEN SECT=I:GOTO 6060
6330 IF CH=66 THEN MAX=125:GOSUB 6500:BUFIN$(128,128)=CHR$(DAT+(DAT<125)*128):GOTO 6100
6340 IF CH=70 THEN MAX=63:GOSUB 6500:BUFIN$(126,126)=CHR$(USR(BINAND,ASC(BUFIN$(126,126)),3)+DAT*4):GOTO 6100
6350 IF CH=87 THEN 6600
6360 IF CH<>78 THEN ? B$;:GOTO 6250
6370 MAX=1023:IF TYPE=18 THEN MAX=719
6380 GOSUB 6500:BUFIN$(127,127)=CHR$(USR(BINAND,DAT,255))
6390 BUFIN$(126,126)=CHR$(USR(BINAND,ASC(BUFIN$(126,126)),252)+INT(DAT/256))
6400 GOTO 6100
6500 REM GET NUMBER UP TO 'MAX'
6510 POSITION 3,20:? D$;"      Enter new ";
6520 IF MAX=63 THEN ? "file number ";
6530 IF MAX=125 THEN ? "byte count ";
6540 IF MAX>700 THEN ? "next sector no. ";
6550 POKE 752,0:TRAP 6560:DAT=0:INPUT DAT
6560 POKE 752,1:POSITION 3,20:? D$:IF DAT<>INT(DAT) OR DAT>MAX THEN ? B$;:GOTO 6510
6570 TRAP 40000:RETURN
6600 REM WRITE SECTOR AND GO ON
6610 BUFOUT$=BUFIN$
6620 GOSUB 10100:IF ERR<>1 THEN ? "   *** ERROR WRITING SECTOR ";SECT;" ***";:GOSUB 10200:GOTO 20000
6630 SECT=I:GOTO 6060
10000 REM GET SECTOR INTO BUFIN$
10010 Z=USR(ADR(GSECT$),SECT,ADR(BUFIN$),DRIVE)
10020 ERR=PEEK(771):RETURN
10100 REM WRITE SECTOR FROM BUFOUT$
10110 Z=USR(ADR(PSECT$),SECT,ADR(BUFOUT$),DRIVE)
10120 ERR=PEEK(771):RETURN
10200 REM WAIT WITH ERROR MESSAGE
10210 ? B$;:POKE 764,255:I=0
10220 I=I+1:IF I<250 AND PEEK(764)=255 THEN 10220
10230 POKE 764,255:RETURN
10300 REM CHECK FOR VALID DOS 2 DISK
10310 TYPE=18:SECT=1024:GOSUB 10000:IF ERR=1 THEN TYPE=26
10320 SECT=360:GOSUB 10000:IF ERR<>1 THEN ? D$;"       *** DISK READ ERROR ***";:GOSUB 10200:POP :GOTO 20000
10330 IF BUFIN$(1,1)<>CHR$(2) THEN ? D$;"    *** NOT DOS 2 FORMAT! ***";:GOSUB 10200:POP :GOTO 20000
10340 RETURN
11000 REM PLOT ZERO
11001 PLOT X-1,Y-4:DRAWTO X-1,Y:DRAWTO X+1,Y:DRAWTO X+1,Y-4:DRAWTO X-1,Y-4
11009 RETURN
11010 REM PLOT ONE
11011 PLOT X-1,Y-3:PLOT X,Y-4:DRAWTO X,Y:PLOT X-1,Y:PLOT X+1,Y
11019 RETURN
11020 REM PLOT TWO
11021 PLOT X-1,Y-3:PLOT X,Y-4:PLOT X+1,Y-3:PLOT X+1,Y-2:DRAWTO X-1,Y:DRAWTO X+1,Y
11029 RETURN
11030 REM PLOT THREE
11031 PLOT X-1,Y-4:DRAWTO X+1,Y-4:DRAWTO X+1,Y:DRAWTO X-1,Y:PLOT X,Y-2
11039 RETURN
11050 REM PLOT FIVE
11051 PLOT X+1,Y-4:DRAWTO X-1,Y-4:DRAWTO X-1,Y-2:PLOT X,Y-2:PLOT X+1,Y-1:PLOT X,Y:PLOT X-1,Y
11059 RETURN
11090 REM PLOT NINE
11091 PLOT X-1,Y:DRAWTO X+1,Y:DRAWTO X+1,Y-4:DRAWTO X-1,Y-4:DRAWTO X-1,Y-2:PLOT X,Y-2
11099 RETURN
12000 REM MESSAGE "TRACK"
12001 PLOT X-1,Y-4:PLOT X+1,Y-4:PLOT X,Y-4:DRAWTO X,Y:X=X+4
12002 PLOT X-1,Y:DRAWTO X-1,Y-4:DRAWTO X+1,Y-4:PLOT X+1,Y-3:PLOT X,Y-2:DRAWTO X+1,Y:X=X+4
12003 PLOT X-1,Y:DRAWTO X-1,Y-4:DRAWTO X+1,Y-4:DRAWTO X+1,Y:PLOT X,Y-2:X=X+4
12004 PLOT X+1,Y:DRAWTO X-1,Y:DRAWTO X-1,Y-4:DRAWTO X+1,Y-4:X=X+4
12005 PLOT X-1,Y:DRAWTO X-1,Y-4:PLOT X,Y-2:PLOT X+1,Y:PLOT X+1,Y-1:PLOT X+1,Y-3:PLOT X+1,Y-4
12009 RETURN
12100 REM MESSAGE "SECT"
12101 PLOT X-1,Y:DRAWTO X+1,Y:DRAWTO X+1,Y-2:DRAWTO X-1,Y-2:DRAWTO X-1,Y-4:DRAWTO X+1,Y-4:Y=Y+9
12102 PLOT X+1,Y:DRAWTO X-1,Y:DRAWTO X-1,Y-4:DRAWTO X+1,Y-4:PLOT X,Y-2:Y=Y+9
12103 PLOT X+1,Y:DRAWTO X-1,Y:DRAWTO X-1,Y-4:Y=Y+9
12104 PLOT X-1,Y-4:PLOT X+1,Y-4:PLOT X,Y-4:DRAWTO X,Y
12105 RETURN
```

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```
20000 REM MAIN MENU
20010 GRAPHICS 0:POKE 752,1:POKE 82,2:
SETCOLOR 2,12,4:SETCOLOR 4,12,6:SETCOL
OR 1,0,12
20020 ? :? "      DOS 2.0/2.5 DISK VIE
WER":? "      ";UL$(1,23)
20030 ? :? "       By Andre Willey, 19
87"
20040 POSITION 7,8:? "D)   View/Edit D
irectory":? :? "     V)   View/Edit VT
OC data"
20050 ? :? "     S)   View/Edit Sector
 Links"
20060 ? :? "     B)   Show/Edit Boot d
ata"
20070 ? :? "     C)   Change drive (Cu
rrent = ";DRIVE;")"
20080 ? :? "     E)   Exit to Basic"
20090 POSITION 10,22:? "Please enter c
hoice"
20100 POKE 694,0:POKE 702,64:GET #1,CH
20110 IF CH=68 THEN 4000
20120 IF CH=86 THEN 3000
20130 IF CH=83 THEN 6000
20140 IF CH=66 THEN 5000
20150 IF CH=67 THEN 20200
20160 IF CH=69 OR CH=27 OR CH=81 THEN
POKE 106,PEEK(106)+16:GRAPHICS 0:END
20170 ? B$;:GOTO 20100
20200 POKE 752,0:POSITION 12,21:? "Cur
rent Drive = ";DRIVE:? "          Ente
r new number: ";
20210 POKE 694,0:POKE 702,64:GET #1,CH
:CH=CH-48:POKE 752,1:IF CH<1 OR CH>4 T
HEN PRINT B$;:GOTO 20200
20220 DRIVE=CH:GOSUB 10300:GOTO 20000
21000 REM INITIALISE
21010 CAT$(1)=CHR$(0):CAT$(1024)=CHR$(
0):CAT$(2)=CAT$:BUFIN$=CAT$:BUFOUT$=CA
T$:VTOC$=CAT$:ESC$=CHR$(27)
21020 HX$="0123456789ABCDEF":D$=CHR$(1
56):C$=CHR$(125):B$=CHR$(253):UL$(1)=C
HR$(13):UL$(40)=CHR$(13):UL$(2)=UL$
21030 RESTORE 21200:FOR I=1 TO 16:READ
 A:BINAND$(I,I)=CHR$(A):NEXT I:BINAND=
ADR(BINAND$)
21040 RESTORE 21210:FOR I=1 TO 16:READ
 A:BINOR$(I,I)=CHR$(A):NEXT I:BINOR=AD
R(BINOR$)
21050 RESTORE 21220:FOR I=1 TO 44:READ
 A:GSECT$(I,I)=CHR$(A):NEXT I:GSECT=AD
R(GSECT$)
21060 RESTORE 21240:FOR I=1 TO 44:READ
 A:PSECT$(I,I)=CHR$(A):NEXT I:PSECT=AD
R(PSECT$)
21070 FOR I=PMBASE+1024 TO PMBASE+1279
:POKE I,0:NEXT I
21080 POS0=53248:POKE POS0,0:POKE 5427
9,PMBASE/256:POKE 53277,2:POKE 704,78:
POKE 53256,0
21090 POKE 559,58
21100 DRIVE=1:TYPE=18
21110 RETURN
21200 DATA 104,104,104,133,208,104,104
,37,208,133,212,169,0,133,213,96
21210 DATA 104,104,104,133,208,104,104
,5,208,133,212,169,0,133,213,96
21220 DATA 104,133,203,169,82,141,2,3,
169,1,141,1,3,104,141,11,3,104,141,10,
3,104,141,5,3,104,141,4,3,165
21230 DATA 203,201,2,240,5,104,104,141
,1,3,32,83,228,96
21240 DATA 104,133,203,169,87,141,2,3,
169,1,141,1,3,104,141,11,3,104,141,10,
3,104,141,5,3,104,141,4,3,165
21250 DATA 203,201,2,240,5,104,104,141
,1,3,32,83,228,96
```

Get it right!

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
1	2976	2	4037	3	3380
10	8451	20	17857	30	9200
50	7334	60	10339	70	2028
80	2690	500	1898	2000	5353
2010	15624	2015	9147	2020	5931
2030	4070	2040	4398	2050	9555
2060	5727	2070	5695	2100	19863
2110	4819	2120	4792	2130	14498
2140	18957	2150	5464	2160	5130
2170	1377	2180	1498	2200	5824
2210	9250	2220	15596	2230	3858
2240	1498	2300	5645	2301	2908
2302	11172	2310	4398	2320	2965
2330	5519	2340	5538	2350	5403
2360	17912	2370	3134	2500	5500
2510	9907	2520	14512	2530	6137
2540	4398	2550	2965	2560	13061
2570	5874	2580	4828	2590	1345
2600	4471	2610	7177	2620	7161
2630	5724	2640	3293	2650	4679
2660	2512	2670	4323	2680	6091
2690	3678	2700	18225	2710	2965
2720	16740	2730	1898	3000	4348
3010	14666	3020	4777	3030	16478
3040	7061	3050	2036	3070	4472
3080	10965	3090	8060	3100	6441
3160	10955	3170	5076	3180	5694
3190	7743	3200	8964	3210	6649
3230	1375	3240	6624	3250	4821
3260	7072	3270	8937	3280	6649
3290	1377	3300	3748	3320	5369
3330	1770	3340	6262	3350	4338
3360	4771	3370	5750	3380	4771
3390	4961	3400	6299	3410	7962
3420	6280	3430	6527	3440	11309
3450	11222	3460	3568	3470	9565
3480	9037	3490	5705	3500	3899
3510	2151	3520	7618	3530	7574
3540	3294	3550	11439	4000	4576
4010	7200	4020	11857	4100	2092
4110	18610	4120	6357	4130	4488
4150	6698	4160	2092	4170	8474

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
4180	17347	4190	3264	4200	5928
4210	4168	4220	15011	4230	8064
4240	7434	4250	15417	4260	4160
4270	14821	4280	8218	4290	10048
4300	13440	4310	7879	4320	13695
4330	13902	4340	13941	4350	12632
4360	13897	4370	13124	4380	17555
4390	12589	4400	10187	4500	5655
4510	8659	4520	9089	4530	8650
4540	9066	4550	4712	4560	6605
4570	4834	4580	5235	4590	5230
4600	5327	4610	4841	4620	4854
4630	4883	4640	5240	4650	3576
4660	9378	4670	9030	4690	5051
4700	5977	4710	13960	4720	6689
4730	6157	4740	15122	4750	16661
4800	4401	4810	4053	4820	4137
4830	4140	4840	3523	4850	1498
4900	4473	4910	12771	4920	6038
4930	5556	4940	14265	4950	9830
4960	6051	4970	6249	4980	1498
5000	5850	5010	7173	5020	14273
5030	16336	5100	6683	5110	6188
5120	8568	5130	13429	5140	13133
5150	15153	5160	15259	5240	13873
5250	13991	5260	4578	5270	11275
5280	13764	5290	9925	5300	5014
5310	6758	5320	7617	5330	3807
5340	3727	5350	1375	5400	10677
5410	7725	5420	5655	5430	4712
5440	3001	5450	2989	5460	4610
5470	2630	5600	6092	5610	3682
5620	5703	5630	6169	5640	6174
5650	5549	5700	5817	5710	17012
5720	12414	5730	9637	5800	6416
5810	6402	5820	14264	5830	1898
5900	6039	5910	6911	5920	7518
5930	5684	5940	7514	5950	1498
6000	5263	6010	15119	6020	10310
6030	5470	6040	16240	6050	5370
6060	17128	6100	4560	6110	2108
6120	2830	6130	8568	6140	2719

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
6150	1375	6160	1377	6170	5067
6180	1784	6200	17327	6210	17573
6220	20156	6230	3245	6240	5046
6250	19517	6300	9708	6310	4712
6320	5510	6330	13910	6340	18313
6350	2998	6360	5451	6370	6238
6380	9492	6390	12670	6400	1861
6500	5022	6510	7341	6520	6960
6530	6623	6540	7802	6550	6916
6560	14563	6570	3535	6600	5160
6610	2965	6620	17479	6630	3097
10000	5413	10010	8196	10020	4104
10100	6161	10110	8488	10120	4104
10200	5495	10210	3722	10220	7198
10230	4005	10300	5902	10310	9406
10320	17688	10330	16153	10340	1498
11000	2626	11001	13292	11009	1498
11010	2278	11011	11147	11019	1498
11020	2331	11021	14532	11029	1498
11030	2931	11031	12524	11039	1498
11050	2586	11051	16553	11059	1498
11090	2570	11091	15424	11099	1498
12000	3736	12001	10591	12002	16147
12003	13710	12004	11614	12005	16746
12009	1498	12100	3439	12101	17387
12102	13593	12103	11643	12104	9345
12105	1498	20000	2558	20010	14862
20020	8613	20030	6705	20040	16310
20050	8370	20060	7554	20070	10172
20080	5906	20090	8895	20100	5655
20110	2982	20120	2979	20130	2970
20140	2975	20150	3222	20160	12421
20170	2696	20200	17742	20210	16970
20220	5954	21000	3133	21010	17117
21020	17989	21030	15509	21040	15148
21050	15183	21060	15279	21070	9060
21080	14952	21090	1984	21100	3127
21110	1498	21200	9816	21210	9575
21220	14772	21230	7589	21240	14792
21250	7589				



Micro route to the sun

ANDY DORAN finds a new use for the Mini Office II spreadsheet

MOST people see spreadsheets as boring programs to use for accounts. This means that lots of interesting uses are overlooked. Let's explore a different use of a spreadsheet using Mini Office II.

If you glance through the glossy pages of a holiday brochure you'll see weather reports and tables which give an indication of the amount of sunshine or rain that a particular resort can expect during the summer months. Such a table can be displayed using a spreadsheet – and with Mini Office II the results can also be shown graphically.

Take the typical British week shown in Figure I. Those figures can easily be entered into the spreadsheet and produce useful figures such as averages.

	MON	TUE	WED	THU	FRI	SAT	SUN
Sun (hours)	8	7	7	8	9	8	9
Rain (inches)	3	2	3	3	1	0	1
Temp (best)	29	28	27	31	32	28	33
Temp (worst)	24	24	25	26	25	26	27

Figure I: A typical week's weather

Now we'll move on to the program. Once you've loaded it you need to make some changes to the default values given. For instance, there is no point in having two decimal places for numbers. To make these changes select Alter screen display from the main menu and you will move to second menu. The options given are clearly explained on pages 49 and 50 of the Mini Office II manual.

You need to alter the number of decimal places to 0 so simply highlight the option decimal places and enter 0 followed by Return. From now on we will assume that you remember to press Return as you make an entry. Once this has been done, pressing Escape takes you back to the spreadsheet menu.

Pressing Escape once more will take you to the spreadsheet itself (at present blank). You use the arrow keys to move the cursor around and at the top of the screen you'll notice the status area.

As the cursor is moved this changes to indicate which cell the cursor currently occupies (such as A1 or B6). When data has been entered other sections of the status line such as contents change to show what is actually in each cell.

The first thing that you need to do is to enter the labels for the spreadsheet – so you know what the values mean later on. To do this we need to move the cursor to cell B1 either by using the cursor keys or the GOTO command – pressing Control+G together gives the prompt *Cell* in the status area and to move to cell B1 just enter B1.

Now you are at cell B1 you can enter the relevant label. Just type the letters MON and move to cell C1 where you type TUE. Continue until all the days have been entered and you should end up with SUN in cell H1. You now need to enter the labels for Sun, Rain and Temp so use the GOTO function to move to cell A2.

The column width at present is 7 which is not big enough to allow the label *Rain (inches)* to be entered.

The width of column A (or any other column) can easily be altered by pressing Control+W. You will be prompted for the new column width so enter 13 to allow room for the label. Now you can enter the labels for Sun, Rain and Temp in the same way as you did for the days.

Now your spreadsheet is labelled and ready for you to enter data – except for one thing. You need to enter some formulae to get the information you were originally looking for – averages and so on.

Use the GOTO command to move to cell I1 and label it AVERAGE. Label cells J1 and K1 MAX and MIN respectively and now move to cell I2. This cell will contain a formula to calculate the average daily sunshine (in hours) over the week. The formula is:

I2=(B2+C2+D2+E2+F2+G2+H2)/7

Fortunately Mini Office II allows you to abbreviate this formula using # to stand for sum of. So the formula becomes:

I2=(B2#H2)/7

Pressing Control+F allows you to enter the formula. The left hand side of the fomula (I2=) appears in the status area and by typing (B2#H2)/7 you will have entered a formula into cell I2. This will read 0 at first as no data has been entered.

The formulae for cells I3 to I5 are

Turn to Page 30 ▶

◀ *From Page 29*

similar to the one you have just entered so rather than enter them again copy them. Make sure the cursor is in cell I2 and press Shift+R.

A message in the status area tells you to move the cursor to the cell you wish to copy to so move the cursor to cell I3 and press Return. The status area now asks if the formula is to be copied Absolutely (exactly the same with no changes) or Relatively (similar, but with changes such as B2 becomes B3).

We need to copy the formula Relatively so press R for each part of the formula (twice in this case). The new formula I3=(B3#H3)/7 will now be shown in the status area and can be copied to I4 and I5 in a similar way. The formula for MAX is in J2. In J2 you require the formula for the maximum of the numbers between B2 and H2. This is: J2=>[B2H2].

Enter this in the same way as you entered the formula for I2 and copy it into the other cells in the column (J3 to J5).

The formula for MIN is similar to the formula for MAX, except that the less than (<) sign is used instead of the greater than (>) sign so enter the last of our formulae into column K starting with K2=<[B2H2].

It is a good idea at this point to save the spreadsheet. This is done by pressing Escape to return to the spreadsheet menu and choosing the Save Spreadsheet option will then cause the computer to prompt:

D1:

At this point enter the name under which this file will be saved. It is best to give a descriptive filename so that in future there is no need to guess the contents of the file. Make sure that there is a formatted disc in the drive – and not the Mini Office II disc. If you haven't already got one a disc may be formatted by using the option from Mini Office II which is available after a directory. Type WEATHER.V01 (as this is the first version of the spreadsheet). Your spreadsheet will now be saved to disc.

Once you have reached this stage most of the hard work has been done. All that remains is to enter the actual data by moving to the relevant cell and typing the number.

For example move to cell B2 and type 8 Return. When you have entered all the data, save the spreadsheet again and you're then ready to print it.

From the main menu choose Print Spreadsheet to move to the print options. You'll have noticed that your spreadsheet has empty rows and columns at the bottom and right-hand edges. It is wasting time printing the whole thing so choose the option Print Part Spreadsheet and enter the following:

Rows:1#5
Columns:A#K

The result will be that only the relevant part of the spreadsheet is printed and when this is completed you will be returned to the print spreadsheet menu. Press Escape to return to the spreadsheet menu and you're ready to save graphics data.

● *Next month we'll look at how to present this small spreadsheet pictorally. Until then, create some spreadsheets and save them.*

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more Atari users are doing – use your micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my Atari into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

Telex is just one of a growing number of services available to Atari users on *MicroLink*. With MicroLink you can also read the news as it happens, go teleshopping, create your own closed user group, send telemessages and electronic mail right round the world, download free telesoftware programs directly into your micro . . . and much more.

But why use Telex?

Because it's a standard means of instant communication between businesses. Today there are 150,000 Telex machines in use in Britain – and more than 2 million worldwide. It's used to dramatically speed up business communications – just as quick as using the phone but far more efficient, because you have a hard copy of every "conversation" for your records.

But there's a big bonus you get when you use *MicroLink* for Telex that the conventional way doesn't offer.

With *MicroLink* you don't HAVE to be in your office to send or receive Telex messages. You can just as easily use your computer at home (or even a portable). So now you can check whether there are any Telex messages waiting for you – anywhere, anytime. How's that for your business efficiency?

How to Join: See Page 6

An amazingly easy way out

by Rouloc

HELLO all you fellow adventurers. It's your old pal Rouloc back again to hold court on the world of Adventure. It's good to put my feet up and enjoy a fine ale while I talk to you of high adventure and after the month I have just had it's about time I rested.

For three weeks solid I was fighting the evil gargoyle Mekrah before my trusty sword beheaded the foul creature. But now on to a subject that all adventurers hate ... mazes.

Why do adventure writers still persist in using the infernal things? We all know how to map them (don't we?) and that once they are mapped the route through them is obvious. So the whole exercise is pointless.

The real reason for the dreaded maze is that the programmer wants an easy get out when he is stuck for another puzzle. Instead of finding another trick he throws in a quick maze just to use up playing time.

There are exceptions, of course, and the original Cave adventure from Crowther and Woods, with its "twisty little passages" and "little twisty passages", is one of them.

It was the first one of its type and also it had the added problem of the pirate coming and taking any objects that were dropped. This made mapping very trying indeed.

In Infocom's Hollywood Hijinx the maze is justified because there's a puzzle attached to it. It takes the form of a hidden map of the maze you have to find and, believe me, if you have had to sit through as many mazes as I have, you would not retain your sanity.

What do you think of the maze situation? Write in and tell me, but in the meantime if anybody is writing an adventure and is about to put in a maze – don't!

Yet more Infocom releases are in the pipeline. Plundered Hearts is a true romance story and there's also a rather weird game which goes by the name of Nord 'n' Bert.

I couldn't make Head or Tail of it but I'm led to believe it comprises eight short stories built around the village of Punster, where everything has a double meaning, and things are not quite what they seem.

It all sounds very strange to me, but rest assured if it's Infocom it's got to be good.

Remember Floyd the loveable little robot in Planetfall? Well the good news is that he has returned in a new adventure written by Steve (Planetfall, Leather Goddesses, Hitchhikers) Meretzky.

Stationfall carries on the story of your meteoric rise since your salvation of the planet Resida which earned you a promotion to Lieutenant First Class. No more scrubwork or bathroom details for you. Instead you you are in charge of the paperwork routine, which ensures that all types of forms are in good supply.

The story starts after you have been ordered to go to a nearby space station to collect more forms. The orders are that a duty robot should be assigned to aid you, and as you go to the robot pool to choose one there is old Floyd sitting in his tub playing dice!

The game is quite user friendly and feels quicker and more playable than its predecessor, with some excellent puzzles mixed in with good humour. If you add this to the new-style packaging, which still contains all the usual Infocom bits and pieces, it is a game you will be proud to put into your collection. You can read a full review of Stationfall on page 19 of this issue.

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See you next month



Postbag

DARRYL Canlans from Dublin is stuck in Return to Eden. He keeps getting fried when he tunnels underground and finds the shovel.

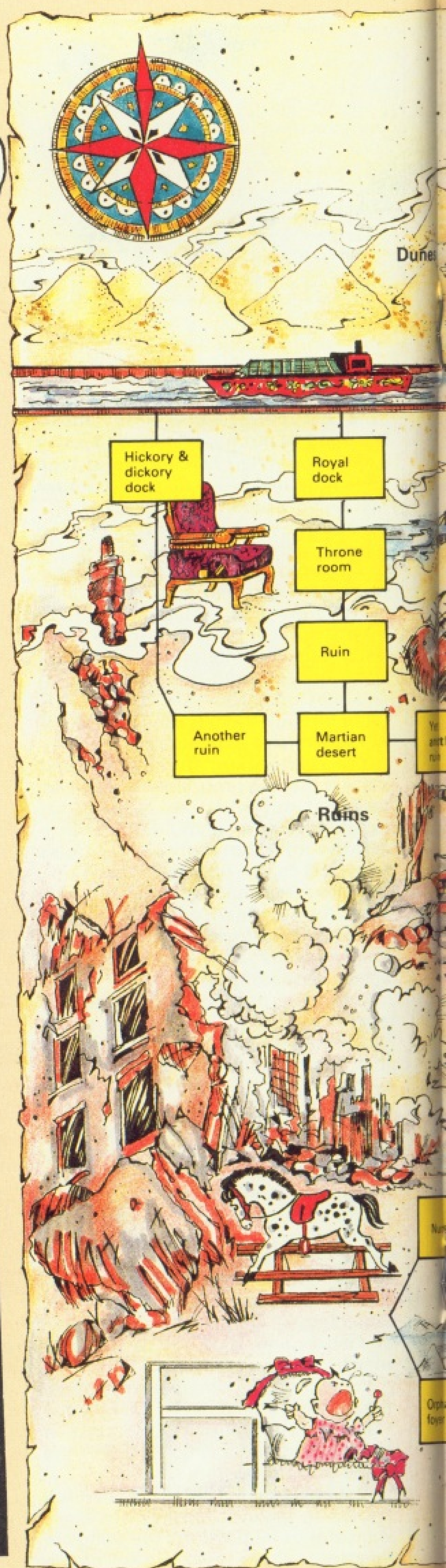
The answer, my friend, is that you only have a set number of moves before the Snowball spaceship finds you and blasts you. So start again and go straight to the shovel, then go down and find a leafy cave underground and sleep until the ship passes by.

Kevin replies to Lee's letter about Ultima IV with information on the characters. Iolo will join you in Trinsic, Paladin Geoffrey in Shelom and Shamino in Skara Brae. Also a black stone can be found at Moonglows moon gate. When it comes up go and press SEARCH.

M. White is in trouble in Alternate Reality because he keeps running out of food and dying. The reason he cannot enter the arena or the palace is that they are extension discs to be released in the future. As far as eating is concerned, try going to an inn and staying the night.

L.C. Williams has a problem in Sorcerer, which is a real shame as he has 350 points. He is stuck after he enters Belboz's hideout because Feearr keeps hitting him with a spell. Has anyone got the answer?

Finally Colin Chambers can't work out the weeder puzzle in Return to Eden. Just wait one turn after it arrives for it to discharge its load, then enter it and wait three moves until it arrives in the NW corner, then leave it.



Hints & Tips

HERE are the answers to Graunch's riddles in Return to Eden:

Genie in the box.
COMPUTER

What goes on four feet then three then two but more feet the weaker it be?
MAN

Rich man wants it, the poor man has it.
NOTHING

Our blood is cold; beneath our arms men walk.
TREES

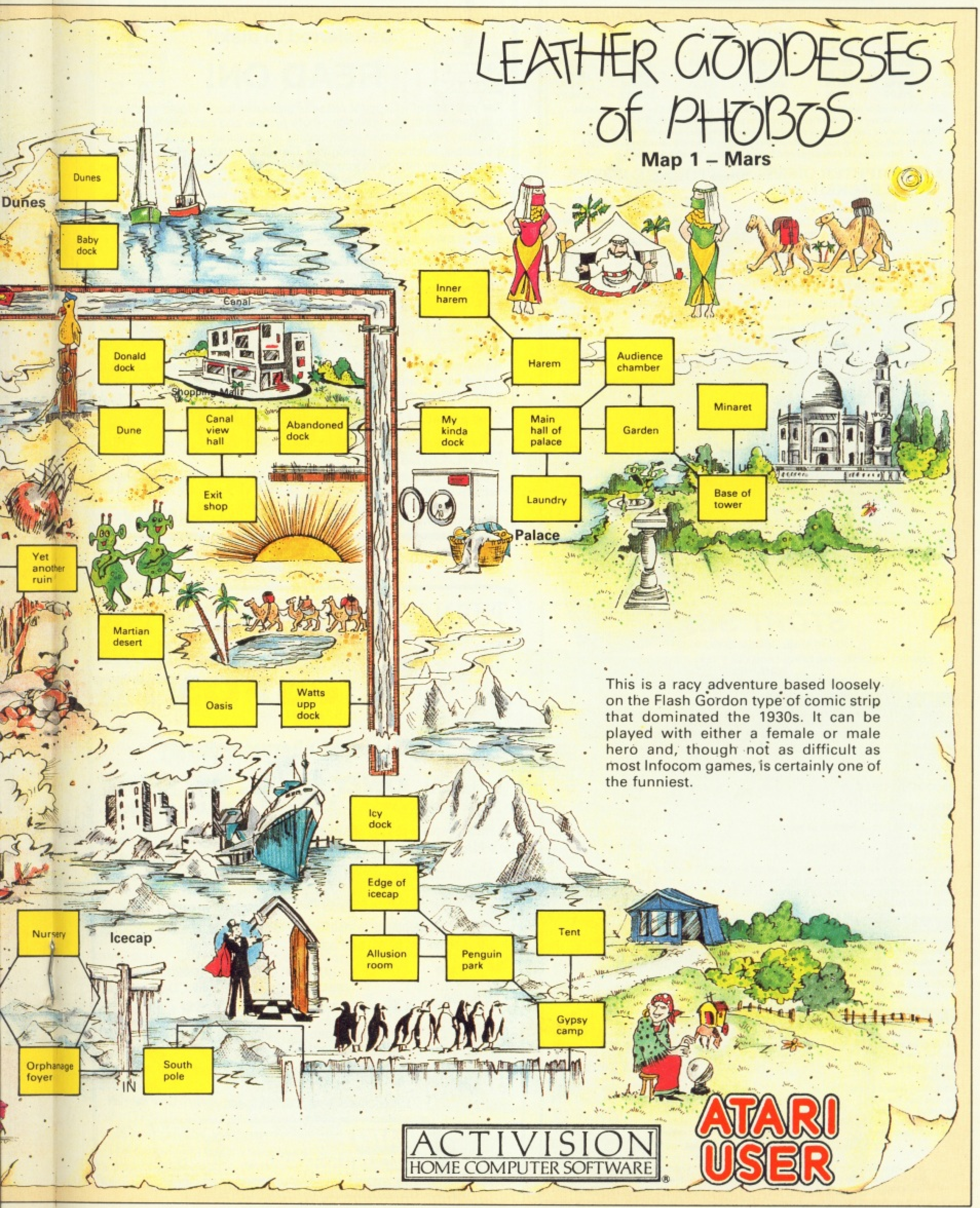
This blind god conquers all.
LOVE

You all know me, you don't trust me yet you give me life.
NEWS

A great healer; beaten, he runs out and flies away.
TIME

When I came you didn't feel me; I am here though you can't see me.
LIFE

A pet to many he belongs, to welcome us he licks our fingers warmly.
FIRE



This is a racy adventure based loosely on the Flash Gordon type of comic strip that dominated the 1930s. It can be played with either a female or male hero and, though not as difficult as most Infocom games, is certainly one of the funniest.

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Are you tired of waiting for cassette games to load? Would you like to transfer them to disk for faster, more reliable and convenient loading? You may have heard or read that this is not possible. Well, not only is it possible, but there is a program, Transdisk IV, that will do it all automatically, you require no knowledge of cassette protection techniques! To put it simply, Transdisk IV will read ANY Atari cassette, (single, multi-stage, non-standard format, 64K – no problem!), remove the protection, then place it on to disk for you. Plus, to load and run the new disk version of a cassette program requires just one keypress from a convenient, autorun menu disk.

The cost of this, the most powerful tape to disk utility for the Atari is just, £24.95 inclusive of first class delivery. Also comes complete with comprehensive instructions which were specially written with the cassette upgrader and first time disk user in mind.

Requires: Atari 800XL or 130XE Computer with disk drive and cassette recorder.

Remember, that not only will you save money on upgrades to disk (if they are available) but many games are only available on cassette anyway so Transdisk IV has to be a worthwhile investment!

Send an SAE or phone for more details of this utility.

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Knockout Whist

OLIVER CHAPPELL

revamps an old favourite

BEAT your Atari computer in this familiar card game. You need a combination of luck and skill – luck is involved when you are dealt your hand, skill as you deduce which cards the computer still has left and you choose the card to lay.

The object of the game is to win tricks so you can choose trumps for the next hand. Once you take all the tricks in a hand you win the entire game.

You start with seven cards – in each subsequent hand you'll have one less. Whoever takes the most tricks in a hand chooses trumps next time – a considerable advantage. In the event of a draw (you both have the same number of tricks) the computer will randomly determine trumps.

When the game has loaded and is run you will be presented with seven cards – trumps will already have been randomly chosen and indicated in the bottom left of the screen. Also, the message "My trumps" or "Your Trumps" indicates whether the computer or you have control of that particular hand.

To lay a card, press keys 1 to 7 which correspond to the cards displayed from top left. The computer will then display its card, and decide who's won.

When you have to choose trumps, use Option, Select and Start as explained on the screen.

The game will give you hours of fun as you challenge the computer. Good luck.

PROGRAM BREAKDOWN

10-140	Main routine – sets up variables
1000-1120	Shuffles pack and deals cards
2000-2110	Routine to sort numbers to represent cards
3000-3999	Sets up screen for cards dealt
4000-4100	End of hand routine-decides who chooses trumps
4500-4550	Checks if game is won outright
5000-5140	Checks who lays first and prompts them to lay their card
6000-6180	Allows you to lay your card and displays it on-screen
6200-6260	Checks who won trick
6300-6395	Produces sound if computer won trick
6400-6495	Produces sound if you win trick
6800-6840	Checks for wrong keypress
6900-6965	Decides trumps
7000-7230	Works out which card to lay
7990-7999	Tells you they have no tricks
8000-8090	Displays symbol when trumps have been chosen and tells program who should lay first
8100-8160	Deals with computer choosing trumps
8200-8255	Prints trumps and who has chosen them
8300-8399	Lets you choose trumps, obtains trump advice or selects random trumps
8800-8860	Allows you to get computer's advice about trumps
10000-10070	Introduction screen
30000-30050	Redefine certain characters for the game

Turn to Page 36 ►

◀ *From Page 35*

```
1 REM KNOCKOUT WHIST
2 REM BY OLIVER CHAPPELL
3 REM (c)ATARI USER
4 REM
10 REM *** MAIN LOOP ***
20 DIM F(52),A(20),B(20),C(20)
30 DIM A$(20),B$(2),C$(8),E$(2),F$(2),
IN$(8)
40 GOSUB 10000:OPEN #1,4,0,"K:"
50 MYTR=0:YOTR=0:GDD=0:BIGCARD=7:CARD=
7:RET=0
60 FOR R=1 TO 20:A(R)=0:B(R)=0:NEXT R
70 SETCOLOR 4,0,8:SETCOLOR 0,9,2:SETCO
LOR 1,0,0:SETCOLOR 2,0,8:SETCOLOR 3,2,
4
80 ? "────────┤ KNOCKOUT WHIST ├────
───"
90 A=7:B=7
100 GOSUB 1000
110 GOSUB 3000
120 CHOO=0
130 GOSUB 8000
140 GOTO 5000
1000 REM *** SET UP THE PACK ***
1010 FOR R=1 TO 52:F(R)=0:NEXT R
1020 FOR R=1 TO 7
1030 A=INT(RND(1)*52)+1
1040 IF F(A)<>1 THEN A(R)=A:F(A)=1:GOT
0 1060
1050 GOTO 1030
1060 NEXT R
1070 FOR R=1 TO 7
1080 A=INT(RND(1)*52)+1
1090 IF F(A)<>1 THEN B(R)=A:F(A)=1:GOT
0 1110
1100 GOTO 1080
1110 NEXT R
1120 RETURN
2000 REM *** DECODE NO. TO CARD ***
2005 IF M=0 THEN A$="  ":RETURN
2010 IF M<14 THEN A$(2,2)="♣":B$(2,2)=
"├"
2020 IF M>13 AND M<27 THEN A$(2,2)="♥"
:B$(2,2)="▌":M=M-13
2030 IF M>26 AND M<40 THEN A$(2,2)="♠"
:B$(2,2)="┘":M=M-26
2040 IF M>39 THEN A$(2,2)="♦":B$(2,2)=
"┣":M=M-39
2050 IF M=13 THEN A$(1,1)="A":B$(1,1)=
"A"
2060 IF M=9 THEN A$(1,1)="+":B$(1,1)="
+"
2070 IF M=10 THEN A$(1,1)="J":B$(1,1)=
"J"
2080 IF M=11 THEN A$(1,1)="Q":B$(1,1)=
"Q"
2090 IF M=12 THEN A$(1,1)="K":B$(1,1)=
"K"
2100 IF M<9 THEN A$(1,1)=STR$(M+1):B$(
1,1)=STR$(M+1)
2110 RETURN
3000 REM *** START ROUTINE & DEAL ***
3010 POKE 752,1:TOT=0
3020 AAA=PEEK(560)+256*PEEK(561)
3030 POKE AAA+10,6
3040 POKE AAA+11,6
3050 POKE AAA+19,6:POKE AAA+20,6
3060 IF BIGCARD>1 THEN POSITION 4,5:?
BIGCARD;" CARDS EACH":FOR R=12 TO 0 ST
EP -1:GOTO 3080
3070 POSITION 4,5:? "1 CARD EACH":FOR
R=12 TO 0 STEP -1
3080 SOUND 0,20,10,14:FOR T=1 TO R:NEX
T T:SOUND 0,0,0,0:FOR T=1 TO R:NEXT T:
NEXT R
3090 FOR R=1 TO 17:POSITION 0,R:? "
                                     "

3100 IF R=5 OR R=13 THEN POSITION 39,R
:? " "
3110 NEXT R:IF GDD=1 THEN GDD=0:RETURN

3120 POSITION 31,10:? "/────\"
3130 FOR R=11 TO 12:POSITION 31,R:? "┤
      ├":NEXT R
3140 POSITION 15,13:? "┐   /"
3150 POSITION 35,13:? "┐   /"
3160 FOR R=14 TO 15:POSITION 31,R:? "┤
      ├":NEXT R
3170 POSITION 34,11:? "MY":POSITION 33
,15:? "CARD"
3180 POSITION 31,16:? "◢────◣"
3190 TOT=0:FOR R=2 TO 11 STEP 8
3200 FOR T=1 TO 36 STEP 10
3210 POSITION T,R:? "/────\"
3220 FOR Y=R+1 TO R+2:POSITION T,Y:? "
|       ├":NEXT Y
3230 TOT=TOT+1
3240 M=A(TOT)
3250 GOSUB 2000
3260 POSITION T+1,R+1:? A$
3270 POSITION (T-1)/2,R+3:? "┐";B$(2,2
);B$;"/"
3280 POSITION (T+38)/2,R+3:? "┐";B$(2,
2);B$;"/"
3290 POSITION 30,0
3300 IF TOT>=CARD THEN POP :GOTO 3330
3310 NEXT T
3320 NEXT R
3330 TOT=0:FOR R=2 TO 11 STEP 8
3340 FOR T=1 TO 36 STEP 10
3350 POSITION T,R+4:? "┤        ├":POSIT
ION T,R+5:? "┤       ├"
3360 M=A(TOT+1):GOSUB 2000:POSITION T+
5,R+5:? A$
3370 POSITION T,R+6:? "◢────◣"
3380 TOT=TOT+1:IF TOT>=CARD THEN POP :
GOTO 3999
3390 NEXT T
3400 NEXT R
3999 POP :RETURN
4000 REM *** END OF HAND ROUTINE ***
4010 ? "K":POSITION 2,0:? "────────┤
KNOCKOUT WHIST ├────────":IF MYTR=0 O
R YOTR=0 THEN 4500
4020 IF YOTR>MYTR THEN CHOO=1
4030 IF MYTR>YOTR THEN CHOO=2
4040 IF MYTR=YOTR THEN CHOO=0
4050 BIGCARD=BIGCARD-1:CARD=BIGCARD:YO
TR=0:MYTR=0:LEAD=CHOO
4060 GOSUB 1000
4070 GDD=1:GOSUB 3000
4080 GOSUB 3120
4090 GOSUB 8000
4100 GOTO 5030
4500 REM *** HAS ANYONE WON? ***
4510 IF MYTR=0 THEN POSITION 6,5:? "YO
U WIN"
4520 IF YOTR=0 THEN POSITION 7,5:? "I
WIN"
4530 POSITION 4,13:? "PRESS ANY KEY"
4540 POKE 764,255:GET #1,LL
4550 POKE 82,2:? "K":POSITION 2,0:GOTO
 50
5000 REM *** WHO LAYS? ***
5010 IF CARD=7 THEN LEAD=1
5020 IF CARD<7 THEN LEAD=WIN
5030 IF LEAD=1 THEN 6000
5040 F=0:G=0:FOR R=1 TO CARD
5050 M=B(R):GOSUB 2000
5060 IF M>F THEN F=M:G=R
5070 NEXT R
5080 M=B(G):GOSUB 2000:B(G)=0:E$=A$:EE
=M:FOR R=G TO 10:B(R)=B(R+1):NEXT R
5090 POSITION 15,19:? "( MY LAY"
5100 POSITION 15,13:? "┐";B$(2,2);B$;"
/"
5110 POSITION 35,13:? "┐";B$(2,2);B$
5120 POSITION 32,11:? A$;"    ":POSITI
ON 32,15:? "    ";A$
5130 IF LEAD=1 THEN 6200
5140 GOTO 6000
6000 REM *** HUMAN LAYS ROUTINE ***
6005 IF LEAD=2 THEN FOR MN=1 TO 40:NEX
T MN
6010 POSITION 15,20:? "( YOUR LAY  "
6020 POKE 764,255:GET #1,LL:LL=LL-48
6025 IF LL=111 THEN POSITION 1,1:FOR R
=1 TO CARD:M=B(R):GOSUB 2000:? A$;" ";
:NEXT R:GOTO 6020
6030 IF LL<1 OR LL>CARD THEN 6000
6035 POSITION 1,1:? "
      "
6040 M=A(LL):GOSUB 2000:FF=M:F$=A$
6050 GOSUB 6900:A(LL)=0
6060 FOR R=LL TO 10:A(R)=A(R+1):NEXT R
6070 TOT=1:FOR R=2 TO 11 STEP 8
6080 FOR T=1 TO 36 STEP 10
6090 IF TOT=LL THEN 6150
6100 IF TOT=8 THEN 6170
6110 FOR Y=R TO R+2:POSITION T,Y:? "
      ":NEXT Y
6120 FOR Y=R+4 TO R+6:POSITION T,Y:? "
        ":NEXT Y
6130 POSITION (T-1)/2,R+3:? "      "
6140 POSITION (T+38)/2,R+3:? "      "
6150 TOT=TOT+1:NEXT T
6160 NEXT R
6170 IF LEAD=1 THEN FOR MN=1 TO 30:NEX
T MN:POSITION 15,19:? "( MY LAY":GOTO
7000
6180 GOTO 6200
6200 REM *** WHOSE CARD IS BEST? ***
6210 IF F$(2,2)=E$(2,2) AND FF>EE THEN
```

```
 6400
6220 IF F$(2,2)=E$(2,2) AND EE>FF THEN
 6300
6230 IF F$(2,2)=C$(1,1) THEN 6400
6240 IF E$(2,2)=C$(1,1) THEN 6300
6250 IF LEAD=1 THEN 6400
6260 IF LEAD=2 THEN 6300
6300 REM *** COMPUTER WINS ***
6310 FOR MN=1 TO 30:NEXT MN:POSITION 1
5,21:? "( I WIN"
6320 SOUND 0,63,10,14:FOR R=1 TO 20:NE
XT R:SOUND 0,126,10,14:FOR R=1 TO 20:N
EXT R:SOUND 0,0,0,0
6330 WIN=2
6340 MYTR=MYTR+1
6350 POSITION 34,19:? MYTR:POSITION 38
,19:? YOTR
6360 GOSUB 7990
6370 CARD=CARD-1:IF CARD<1 THEN 4000
6380 FOR R=19 TO 21:POSITION 14,R:? "
'              ":NEXT R
6390 GOSUB 3090
6395 GOTO 5000
6400 REM *** HUMAN WINS ***
6410 FOR MN=1 TO 30:NEXT MN:POSITION 1
5,21:? "( YOU WIN"
6420 SOUND 0,32,10,14:FOR R=1 TO 20:NE
XT R:SOUND 0,63,10,14:FOR R=1 TO 20:NE
XT R:SOUND 0,0,0,0
6430 WIN=1
6440 YOTR=YOTR+1
6450 POSITION 34,19:? MYTR:POSITION 38
,19:? YOTR
6460 GOSUB 7990
6470 CARD=CARD-1:IF CARD<1 THEN 4000
6480 FOR R=19 TO 21:POSITION 14,R:? "
'              ":NEXT R
6490 GOSUB 3090
6495 GOTO 5000
6800 REM *** WRONG KEY PRESSED ***
6810 IF CARD<>1 THEN POSITION 15,21:?
"' KEYS 1-";CARD
6820 IF CARD=1 THEN POSITION 15,21:? "
' KEY 1"
6830 SOUND 0,10,10,14:FOR R=1 TO 75:NE
XT R:SOUND 0,0,0,0:POSITION 15,21:? "'
        "
6840 GOTO 6010
6900 REM *** TRUMP CHOOSING LOGIC ***
6905 IF LEAD=1 THEN RETURN
6910 H=0:C=0:S=0:D=0:FOR R=1 TO CARD
6915 M=A(R):GOSUB 2000
6920 IF A$(2,2)="♥" THEN H=H+1
6925 IF A$(2,2)="♣" THEN C=C+1
6930 IF A$(2,2)="♠" THEN S=S+1
6935 IF A$(2,2)="♦" THEN D=D+1
6940 NEXT R
6945 IF E$(2,2)<>F$(2,2) AND E$(2,2)="
♠" AND S>0 THEN 6990
6950 IF E$(2,2)<>F$(2,2) AND E$(2,2)="
♥" AND H>0 THEN 6990
6955 IF E$(2,2)<>F$(2,2) AND E$(2,2)="
♦" AND D>0 THEN 6990
6960 IF E$(2,2)<>F$(2,2) AND E$(2,2)="
♣" AND C>0 THEN 6990
6965 RETURN
6990 POSITION 17,21:? "ILLEGAL"
6995 SOUND 0,10,10,14:FOR R=1 TO 75:NE
XT R:SOUND 0,0,0,0:POSITION 15,21:? "'
          ":GOTO 6010
7000 REM *** COMPUTER LOGIC ***
7010 E$=A$:EE=M
7020 OP=20
7030 FOR R=1 TO CARD
7040 M=B(R):GOSUB 2000
7050 IF M>EE AND A$(2,2)=E$(2,2) AND M
-EE<OP THEN G=R:OP=M-EE
7060 NEXT R
7070 IF OP<>20 THEN 7230
7080 OP=-1:FOR R=1 TO CARD
7090 M=B(R):GOSUB 2000
7100 IF A$(2,2)=E$(2,2) AND EE-M>OP TH
EN G=R:OP=EE-M
7110 NEXT R
7120 IF OP<>-1 THEN 7230
7130 F=7:G=0:FOR R=1 TO CARD
7140 M=B(R):GOSUB 2000
7150 IF A$(2,2)=C$(1,1) AND M<F AND EE
>6 THEN F=M:G=R
7160 NEXT R
7170 IF F<>7 THEN 7230
7180 F=15:G=0:FOR R=1 TO CARD
7190 M=B(R):GOSUB 2000
7200 IF M<F THEN F=M:G=R
7210 NEXT R
7220 IF F=15 THEN STOP
7230 GOTO 5080
7990 REM *** MESSAGE ***
7991 FOR R=1 TO 40:NEXT R:FOR R=19 TO
21:POSITION 15,R:? "              ":NEXT
 R
7992 POSITION 14,21:? "PRESS  SPACE"
7993 IF CARD=2 AND YOTR=0 OR CARD=3 AN
D YOTR=0 THEN 7995
7994 GOTO 7999
7995 POSITION 14,19:? "(  NOTE  (":P
OKE 764,255
7996 POSITION 36,19:? "Y*0":SOUND 0,20
0,10,14:FOR R=1 TO 20:NEXT R:POSITION
36,19:? "Y*0":SOUND 0,0,0,0:FOR R=1 TO
 20:NEXT R
7997 IF PEEK(764)<>255 THEN RETURN
7998 GOTO 7996
7999 POKE 764,255:GET #1,Q:RETURN
8000 REM *** TRUMP CHOOSING ***
8010 RET=0:IF CARD=7 OR CHOO=0 THEN TR
=INT(RND(1)*4)+1
8020 IF CARD<>7 THEN 8080
8030 IF TR=1 THEN C$="♠"
8040 IF TR=2 THEN C$="♥"
8050 IF TR=3 THEN C$="♣"
8060 IF TR=4 THEN C$="♦"
8070 GOTO 8200
8080 IF CHOO=1 THEN 8300
8090 RET=0
8100 REM *** COMP CHOOSES TRUMPS ***
8105 A=0:B=0:C=0:D=0:FOR R=1 TO CARD
8110 IF RET=1 THEN M=A(R):GOSUB 2000:G
OTO 8120
8115 M=B(R):GOSUB 2000
8120 IF A$(2,2)="♠" THEN A=A+M
8125 IF A$(2,2)="♥" THEN B=B+M
8130 IF A$(2,2)="♣" THEN C=C+M
8135 IF A$(2,2)="♦" THEN D=D+M
8140 NEXT R
8145 IF A>=B AND A>=C AND A>=D THEN C$
="♠":GOTO 8200
8150 IF B>=A AND B>=C AND B>=D THEN C$
="♥":GOTO 8200
8155 IF C>=A AND C>=B AND C>=D THEN C$
="♣":GOTO 8200
8160 IF D>=A AND D>=B AND D>=C THEN C$
="♦":GOTO 8200
8200 REM *** PRINT UP TRUMPS ***
8205 POSITION 3,20:? "
          "
8210 IF RET=1 THEN RETURN
8215 POSITION 1,20:? "───────┤";C$;"│
":POSITION 1,19
8220 IF CARD=7 OR CHOO=0 THEN ? " RAND
OM":GOTO 8235
8225 IF CHOO=2 THEN ? "   MY"
8230 IF CHOO=1 THEN ? "  YOUR"
8235 POSITION 9,19:? "┌─┐"
8240 POSITION 2,21:? "TRUMPS └─┘"
8245 POSITION 28,19:? "┌─┐ M*0 Y*0":PO
SITION 28,21:? "└─┘ TRICKS":POSITION 2
8,20:? "│";CARD;"├───────"
8250 FOR R=19 TO 21:POSITION 15,R:? "'
":NEXT R
8255 RETURN
8300 POSITION 8,19:? "OPTION ' CHOOSE
TRUMPS":? "       SELECT ' RANDOM TRUMP
S"
8320 ? "        START ' TRUMP ADVISE"
8330 IF PEEK(53279)=6 THEN 8800
8340 IF PEEK(53279)=5 THEN CHOO=0:GOSU
B 8399:GOTO 8000
8350 IF PEEK(53279)=3 THEN GOSUB 8399:
GOTO 8370
8360 GOTO 8330
8370 POSITION 5,20:? "CHOOSE TRUMPS  ♠
:S ♥:H ♣:C ♦:D"
8380 RET=0
8385 GET #1,LL
8390 IF LL=67 THEN C$="♣":GOTO 8200
8392 IF LL=72 THEN C$="♥":GOTO 8200
8394 IF LL=68 THEN C$="♦":GOTO 8200
8396 IF LL=83 THEN C$="♠":GOTO 8200
8398 GOTO 8385
8399 FOR R=19 TO 21:POSITION 2,R:? "
                          ":NEXT R:
RETURN
8800 REM *** TRUMP ADVICE ***
8810 GOSUB 8399
8820 RET=1:GOSUB 8100
8830 RET=0
8840 POSITION 5,20:? "MY ADVISE ' ";
8842 IF C$="♥" THEN ? "HEARTS"
8844 IF C$="♣" THEN ? "CLUBS"
8846 IF C$="♦" THEN ? "DIAMONDS"
8848 IF C$="♠" THEN ? "SPADES"
8850 FOR R=1 TO 100:NEXT R:GOSUB 8399
```

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◀ From Page 37

```
6860 C$="":CHOO=1:GOTO 8000
10000 REM *** INTRODUCTION SCREEN ***
10010 GOSUB 30000
10020 ? "K":SETCOLOR 4,9,6:SETCOLOR 1,
0,12:POKE 82,11:POSITION 11,5
10030 ? :? "  KNOCKOUT WHIST"
10040 ? :? "BY OLIVER CHAPPELL"
10050 ? :? "    . MAY 1987"
10060 FOR R=1 TO 200:NEXT R
10070 POKE 82,2:? "K":POSITION 2,0:RET
URN
30000 REM *** LOAD CHARACTERS ***
30010 DIM ML$(40)
30020 M=PEEK(106)-4
30030 POKE 106,M-1
30040 CHBASE=256*(M)
30050 GRAPHICS 0:SETCOLOR 2,0,0:POKE 7
52,1:? "KPLEASE WAIT - GRAPHICS DEFINI
NG"
30060 RESTORE 30090:FOR L=1 TO 36:READ
 A
30070 ML$(L,L)=CHR$(A):NEXT L
30080 A=USR(ADR(ML$),M):POKE 756,M
30090 DATA 104,104,104,133,204,169,224
,133,206,162,0,160,0,177,205,145,203,2
00,208,249
30100 DATA 164,204,200,132,204,164,206
,200,132,206,232,224,5,208,232,96
30110 FOR I=0 TO 7:READ D
30120 POKE CHBASE+(11*8)+I,D:NEXT I
30130 DATA 0,206,91,81,81,91,238,0
30140 FOR I=0 TO 7:READ D
30150 POKE CHBASE+(10*8)+I,D:NEXT I
30160 DATA 0,8,12,126,12,8,0,0
30170 FOR I=0 TO 7:READ D
30180 POKE CHBASE+(79*8)+I,D:NEXT I
30190 DATA 60,66,157,161,161,157,66,60
30200 FOR I=0 TO 7:READ D
30210 POKE CHBASE+(70*8)+I,D:NEXT I
30220 DATA 7,31,56,112,96,192,192,192
30230 FOR I=0 TO 7:READ D
30240 POKE CHBASE+(71*8)+I,D:NEXT I
30250 DATA 224,248,28,14,6,3,3,3
30260 FOR I=0 TO 7:READ D
30270 POKE CHBASE+(72*8)+I,D:NEXT I
30280 DATA 192,192,192,96,112,56,31,7
30290 FOR I=0 TO 7:READ D
30300 POKE CHBASE+(74*8)+I,D:NEXT I
30310 DATA 3,3,3,6,14,28,248,224
30320 FOR I=0 TO 7:READ D
30330 POKE CHBASE+(7*8)+I,D:NEXT I
30340 DATA 255,129,129,129,129,129,129
,255
30350 FOR I=0 TO 7:READ D
30360 POKE CHBASE+(8*8)+I,D:NEXT I
30370 DATA 255,129,129,153,153,129,129
,255
30380 FOR I=0 TO 7:READ D
30390 POKE CHBASE+(5*8)+I,D:NEXT I
30400 DATA 8,8,8,8,8,8,8,8
30410 FOR I=0 TO 7:READ D
30420 POKE CHBASE+(6*8)+I,D:NEXT I
30430 DATA 16,16,16,16,16,16,16,16
30440 FOR I=0 TO 7:READ D
30450 POKE CHBASE+(1*8)+I,D:NEXT I
30460 DATA 0,24,60,126,126,24,60,0
30470 FOR I=0 TO 7:READ D
30480 POKE CHBASE+(2*8)+I,D:NEXT I
30490 DATA 0,54,127,127,62,28,8,0
30500 FOR I=0 TO 7:READ D
30510 POKE CHBASE+(3*8)+I,D:NEXT I
30520 DATA 0,28,28,119,119,8,28,0
30530 FOR I=0 TO 7:READ D
30540 POKE CHBASE+(4*8)+I,D:NEXT I
30550 DATA 0,24,60,126,126,60,24,0
30560 RETURN
```

Get it right!

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
1	3849	2	4422	3	3380
4	871	10	3530	20	4039
30	5954	40	4803	50	8492
60	6327	70	13897	80	4729
90	1208	100	1925	110	1931
120	1250	130	1946	140	1856
1000	4714	1010	4961	1020	2104
1030	3240	1040	7234	1050	1860
1060	1363	1070	2104	1080	3240
1090	7220	1100	1880	1110	1363
1120	1498	2000	5082	2005	4658
2010	5737	2020	8615	2030	8038
2040	7116	2050	5552	2060	5357
2070	5588	2080	5626	2090	5599
2100	7802	2110	1498	3000	5559
3010	3105	3020	4549	3030	2399
3040	2401	3050	4716	3060	15343
3070	8931	3080	14532	3090	9298
3100	7334	3110	7075	3120	3552
3130	7916	3140	3630	3150	3632
3160	7943	3170	8333	3180	3614
3190	4966	3200	3553	3210	3464
3220	8797	3230	1989	3240	1487
3250	1928	3260	3832	3270	6435
3280	6836	3290	2536	3300	5987
3310	1367	3320	1363	3330	4966
3340	3553	3350	8435	3360	7931
3370	3727	3380	8047	3390	1367
3400	1363	3999	2433	4000	5688
4010	14420	4020	5001	4030	5006
4040	4992	4050	11338	4060	1925
4070	2965	4080	1945	4090	1946
4100	1868	4500	4648	4510	7898
4520	7147	4530	5896	4540	3850
4550	6974	5000	3549	5010	4035
5020	4638	5030	3586	5040	4284
5050	2967	5060	3861	5070	1363
5080	12187	5090	4755	5100	5200
5110	4825	5120	8606	5130	3592

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
5140	1858	6000	5410	6005	6943
6010	5600	6020	5581	6025	16076
6030	5034	6035	5148	6040	5219
6050	3360	6060	5904	6070	4967
6080	3553	6090	3871	6100	3166
6110	8269	6120	8930	6130	4799
6140	5070	6150	3382	6160	1363
6170	14089	6180	1864	6200	5324
6210	6025	6220	6024	6230	4275
6240	4268	6250	3598	6260	3600
6300	4621	6310	9111	6320	16265
6330	1092	6340	2568	6350	8486
6360	2024	6370	5938	6380	8780
6390	1976	6395	1856	6400	3728
6410	9488	6420	15971	6430	1091
6440	2556	6450	8486	6460	2024
6470	5938	6480	8780	6490	1976
6495	1856	6800	5394	6810	9227
6820	7285	6830	13877	6840	1862
6900	5883	6905	4368	6910	5713
6915	2963	6920	3961	6925	3995
6930	4519	6935	4321	6940	1363
6945	8731	6950	8094	6955	8566
6960	8164	6965	1498	6990	4770
6995	15743	7000	4729	7010	1864
7020	972	7030	2878	7040	2967
7050	9790	7060	1363	7070	3555
7080	3884	7090	2967	7100	8263
7110	1363	7120	3540	7130	4312
7140	2967	7150	8353	7160	1363
7170	2906	7180	4708	7190	2967
7200	3859	7210	1363	7220	3329
7230	1888	7990	3372	7991	12686
7992	5742	7993	9688	7994	1968
7995	7515	7996	22760	7997	5701
7998	1953	7999	5451	8000	4719
8010	9296	8020	3668	8030	3664
8040	3175	8050	3242	8060	3565
8070	1868	8080	3618	8090	1092

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
8100	5768	8105	5618	8110	7377
8115	2967	8120	4439	8125	3953
8130	4023	8135	4349	8140	1363
8145	8337	8150	8100	8155	8142
8160	8313	8200	4919	8205	6081
8210	3973	8215	8136	8220	8365
8225	4297	8230	4670	8235	3335
8240	4992	8245	15874	8250	7359
8255	1498	8300	13662	8320	5229
8330	4452	8340	9178	8350	7456
8360	1883	8370	8810	8380	1092
8385	1826	8390	4979	8392	4882
8394	5383	8396	5504	8398	1928
8399	11670	8800	4357	8810	2012
8820	3079	8830	1092	8840	5680
8842	4343	8844	4098	8846	4953
8848	4799	8850	5955	8860	3837
10000	5896	10010	2027	10020	11802
10030	4316	10040	4879	10050	4098
10060	3910	10070	7232	30000	4762
30010	1742	30020	2288	30030	2098
30040	2611	30050	14195	30060	6547
30070	4054	30080	5303	30090	12057
30100	9895	30110	3605	30120	5457
30130	4426	30140	3605	30150	5456
30160	3868	30170	3605	30180	5495
30190	5052	30200	3605	30210	5486
30220	4883	30230	3605	30240	5487
30250	4073	30260	3605	30270	5488
30280	4871	30290	3605	30300	5490
30310	4072	30320	3605	30330	5299
30340	5652	30350	3605	30360	5304
30370	5643	30380	3605	30390	5289
30400	3300	30410	3605	30420	5294
30430	4447	30440	3605	30450	5269
30460	4391	30470	3605	30480	5274
30490	4268	30500	3605	30510	5279
30520	4260	30530	3605	30540	5284
30550	4391	30560	1498		

Packing code into memory the easy way

MARTIN MALE shows how to include machine code in Basic data

IF you're frustrated by the difficulty of combining short machine code routines with Basic on the Atari here is a routine to solve your problems.

Writing the code is no trouble, using, for example, an Atari Assembler-Editor cartridge. Atari Basic does allow calls to machine-code programs via the USR function. The problem is getting the machine code into memory.

Disc drive owners can do this by using the Dos Loadbinary function (L) to load the assembled object code before loading the Basic program that uses it.

This is, however, a little cumbersome, and you can easily forget to load in the machine code routine before running the Basic program that calls it. Cassette users are not even that lucky: Atari Basic doesn't support Binary load from cassette at all.

You can convert the codes by hand to decimal and poke them directly into memory or into data statements, but this is hard work (not to mention tedious) and takes a long time.

Machine Code Merger overcomes all these problems in a relatively quick and easy-to-use fashion. It takes the assembled machine code from an object file on cassette or disc and creates Basic data statements containing the codes, together with a loader routine. This can be merged with a Basic program so the machine code is loaded by the program itself.

When you run the routine you will be presented with a menu containing three options – Load binary (object code), Write Basic code and Quit

Select 1 to load-in your machine code routine. You can load from cassette or disc and the program will tell you the start address of the code and the number of bytes it contains. You will then be returned to the main menu.

The second option creates and writes the Basic code ready to merge with your Basic program. You will be asked what Basic line you want the DATA statements to start at. If you just press Return, the default of line 10000 – which is out of the way of most Basic programs will be chosen.

You will then be asked if the machine code is relocatable. If you select relocatable, you will be asked for the name of the Basic string you wish to hold the machine-code data in – the default is MC$.

You are then asked for the output device. Any of the standard Atari devices can be used, such as E: to list to the screen, P: to print on a printer, C: to list to cassette, or D:filename to list to disc.

If you have a disc drive then you need only write the filename and can leave off the D: device specifier if you wish. If you hit Return only, the data will be listed to the screen. When the Data statements have been written, you will be returned to the main menu again.

To use the routine you must first assemble your machine-code using any assembler and save the object code to cassette or disc. Then load and run Machine Code Merger. Type 1 to load the object code, then 2 to create the Basic code.

You can list it to the screen first if you wish to see what the code looks like by entering E:, or just Return as the output device. Then select 2 again at the main menu to write the code to disc or cassette this time entering D:filename or C: as the output device.

To merge this file into your Basic program, first load in your Basic program, then type ENTER "D:filename" or ENTER"C:". If you then list the program you will see that the loader routine and the machine code data has been added to your program.

At the beginning of your Basic program add a GOSUB to the loader routine (GOSUB 10000, if you have used the default starting line). When the program is run this will load the machine code held in the data statements into memory.

To call the routine use the statement:

```
X=USR(start,par1,par2,...)
```

The start address (START) of your machine code routine can be found with ADR(MC$) if the routine has been specified as relocatable. The other parameters, *par1* and *par2* and so on, are variables you may be passing to your routine.

Your routine can also pass a single two-byte (0 to 65535) number back to Basic using the variable *X* by storing the number in locations (decimal) 212 (lo-byte) and 213 (hi-byte).

Finally, here's some points about the program:

- Machine Code Merger will write two different loader routines and store the machine code differently depending on whether you say your code is Absolute or Relocatable.

If your code is relocatable (that is, it contains no absolute references to itself) the machine code is stored in a Basic string called MC$. If the routine is not relocatable it is POKEd directly into memory at the address it was assembled with.

You should note that if you do write absolutely located routines be sure to locate them where they will not interfere with Basic (page 6 is usually a safe place to put them).

- The program cannot handle composite object files (ones that have been appended using Dos or programs assembled using multiple origins).
- You can have more than one routine in your program by specifying a different starting line number for each routine you convert. Remember, however, when the routines are relocatable, to make sure that the names of the strings that contain the machine code are different (MC1$, MC2$ and so on) before you run your final program.

They can be changed after you have merged them if you did not choose different names when running Machine Code Merger.

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◄ From Page 39

```
10 REM ****************************
20 REM *** MACHINE CODE MERGER ***
30 REM ***        BY M MALE       ***
40 REM ***     (c)ATARI USER      ***
50 REM ****************************
100 DIM CODE$(2048):REM PUT A BIGGER
VALUE IN HERE IF M/C > 2KBYTES LONG
110 DIM
BYTE(5),FL$(20),A$(20),MC$(15):PROMPT=
300
120 REM START OF PROGRAM
130 SETCOLOR 2,0,0:? CHR$(125):? "
MACHINE CODE MERGER PROGRAM":? "
BY M.MALE (C)ATARI USER"
140 ? :? :? "1. LOAD OBJECT CODE"
150 ? :? "2. CREATE BASIC CODE"
160 ? :? "3. QUIT"
170 ? :?
180 ? "INPUT CHOICE:";
190 OPEN #2,4,0,"K:":GET #2,K:CLOSE #2
192 IF K<49 OR K>51 THEN ?
CHR$(253);:GOTO 190
195 K=K-48:? K
200 ON K GOSUB 1000,2000,999
210 GOTO 130
300 REM PROMPT
310 ? :? "      PRESS RETURN FOR MENU"
320 OPEN #2,4,0,"K:"
330 GET #2,K:CLOSE #2
340 RETURN
999 END
1000 REM LOAD BINARY FILE INTO MEMORY
1010 ? :? "OBJECT FILE LOAD, INPUT
DEVICE "
1020 ? "    C = CASSETTE    D = DISK":?
1030 OPEN #2,4,0,"K:":GET #2,K:CLOSE
#2:A$=CHR$(K)
1040 IF A$="C" THEN FL$="C:":? "READY
CASSETTE AND PRESS RETURN";:INPUT
A$:GOTO 1090
1050 IF A$<>"D" THEN ? CHR$(253);:GOTO
1030
1060 FL$="D:"
1070 PRINT "INPUT FILENAME :";:INPUT
A$
1080 FL$(3)=A$
1090 TRAP 5000
1100 ? :? "LOADING ";FL$;"..."
1110 POKE 764,12:OPEN #1,4,0,FL$
1120 POKE 764,255
1130 FOR I=0 TO 5:GET
#1,K:BYTE(I)=K:NEXT I
1140 IF BYTE(0)<>255 OR BYTE(1)<>255
THEN ? "NOT A BINARY FILE":CLOSE
#1:GOSUB PROMPT:RETURN
1150 ORG=BYTE(2)+256*BYTE(3)
1160 EN=BYTE(4)+256*BYTE(5)
1170 MAXNUM=EN-ORG+1
1180 FOR I=1 TO MAXNUM
1190 GET #1,K:CODE$(I,I)=CHR$(K)
1200 NEXT I
1210 CLOSE #1
1220 ? :? "FILE LOADED"
1230 ? :? "PROGRAM ORIGIN AT (DEC):
";ORG
1240 ? "PROGRAM LENGTH  (BYTES):
";MAXNUM
1250 GOSUB PROMPT
1260 RETURN
2000 REM OUTPUT BASIC CODE
2010 IF MAXNUM<1 THEN ? :? "NO CODE
LOADED":GOSUB PROMPT:RETURN
2020 ? :? "BASIC LINE NUMBER TO START
LOADER":? "ROUTINE (RETURN = 10000) ";
2030 INPUT A$
2040 START=10000
2050 IF A$<>"" THEN START=VAL(A$)
2060 ?
2070 ? "TYPE    1. FOR ABSOLUTE OR ":?
"       2. FOR RELOCATABLE ":? :?
"MACHINE CODE: ";
2080 OPEN #2,4,0,"K:":GET #2,K:CLOSE
#2
2090 IF K<49 OR K>50 THEN ?
CHR$(253);:GOTO 2080
2100 K=K-48:? K
2102 IF K=1 THEN 2110
2104 ? :? "STRING NAME TO PUT CODE
IN";:INPUT MC$
2106 IF MC$="" THEN MC$="MC"
2108 IF MC$(LEN(MC$))="$" THEN
MC$=MC$(1,LEN(MC$)-1)
2110 TRAP 5000
2120 ? :? "OUTPUT DEVICE:FILENAME ";
2130 INPUT A$
2135 IF A$="" THEN A$="E:"
2140 IF LEN(A$)=1 THEN 2180
2150 IF LEN(A$)=2 THEN IF A$(2,2)<>":"
THEN 2180
2160 IF LEN(A$)>2 THEN IF A$(2,2)<>":"
AND A$(3,3)<>":" THEN 2180
2170 FL$=A$:GOTO 2190
2180 FL$="D:":FL$(3)=A$
2190 ? :? "MAKE DEVICE READY AND PRESS
RETURN";:INPUT A$:? :? "WRITING TO
";FL$;" ..."
2200 POKE 764,12:OPEN #1,8,0,FL$
2210 IF K=1 THEN GOSUB 3100:GOSUB 3200
2220 IF K=2 THEN GOSUB 3000:GOSUB 3200
2230 CLOSE #1
2240 ? :? "FILE WRITTEN."
2250 POKE 764,255
2260 GOSUB PROMPT
2270 RETURN
3000 REM WRITE LOADER ROUTINE
3010 REM (FOR RELOCATABLE CODE)
3020 PRINT #1;START;" DIM
";MC$;"$(";MAXNUM;")"
3030 PRINT #1;START+1;" RESTORE
";START
3040 PRINT #1;START+2;" FOR I=1 TO
";MAXNUM
3050 PRINT #1;START+3;" READ MC:
";MC$;"$(I,I)=CHR$(MC)"
3060 PRINT #1;START+4;" NEXT I"
3070 PRINT #1;START+5;" RETURN"
3080 RETURN
3090 REM
3100 REM CREATE LOADER ROUTINE
3110 REM (FOR ABSOLUTE CODE)
3120 PRINT #1;START;" REM ABSOLUTE
CODE"
3130 PRINT #1;START+1;" RESTORE
";START
3140 PRINT #1;START+2;" FOR I=0 TO
";MAXNUM-1
3150 PRINT #1;START+3;" READ MC: POKE
";ORG;"+I,MC"
3160 PRINT #1;START+4;" NEXT I"
3170 PRINT #1;START+5;" RETURN"
3180 RETURN
3190 REM
3200 REM WRITE DATA
3210 K=0
3220 FOR I=1 TO MAXNUM/16+1
3230 PRINT #1;START+5+I;" DATA ";
3240 K=K+1
3250 FOR J=1 TO 15
3260 IF K<MAXNUM THEN PRINT
#1;ASC(CODE$(K,K));",";:K=K+1
3270 NEXT J
3280 PRINT #1;ASC(CODE$(K,K))
3290 NEXT I
3300 RETURN
5000 REM ERROR TRAP
5005 POKE 764,255
5010 ? :? "ERROR NO:- ";PEEK(195)
5020 GOSUB PROMPT
5030 CLOSE #1
5040 RETURN
```

Get it right!

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
10	4147	20	5692	30	4326
40	5142	50	4147	100	12699
110	7782	120	4176	130	16973
140	5099	150	4793	160	2374
170	833	180	3342	190	5967
192	7247	195	1715	200	4342
210	1617	300	2144	310	8319
320	2693	330	3119	340	1498
999	836	1000	6512	1010	7144
1020	6375	1030	7762	1040	15065
1050	6441	1060	1329	1070	6709
1080	1500	1090	1820	1100	4221
1110	4573	1120	2121	1130	6993
1140	16428	1150	4301	1160	4012
1170	3208	1180	3340	1190	4664
1200	1345	1210	1559	1220	3331
1230	6641	1240	6820	1250	2750
1260	1498	2000	4310	2010	11782
2020	15812	2030	1644	2040	2049
2050	5237	2060	254	2070	14433
2080	5967	2090	7445	2100	1715
2102	2753	2104	8846	2106	3972
2108	7873	2110	1820	2120	6034
2130	1644	2135	3231	2140	3666
2150	6919	2160	9656	2170	2775
2180	2866	2190	14922	2200	4581
2210	5963	2220	5964	2230	1559
2240	3905	2250	2121	2260	2750
2270	1498	3000	5224	3010	5088
3020	7652	3030	6813	3040	7344
3050	8789	3060	4795	3070	5048
3080	1498	3090	871	3100	5233
3110	4427	3120	7190	3130	6813
3140	7616	3150	8247	3160	4795
3170	5048	3180	1498	3190	871
3200	3046	3210	557	3220	4060
3230	5372	3240	929	3250	2290
3260	9752	3270	1347	3280	4314
3290	1345	3300	1498	5000	3182
5005	2121	5010	4978	5020	2750
5030	1559	5040	1498		

SPECIAL FX



In the third part of his series on amazing effects RICHARD VANNER takes a look at scrolling messages

WELCOME to the third instalment of Special FX. We'll follow on from last month's article with another DLI and exploit the Atari's scrolling features. The Atari is still the most powerful 8 bit graphics computer and even the ST has no hardware facilities that can simulate effects produced with the dedicated graphics chip, Antic.

So scrolling is this month's subject for a special effect and again, even if you don't understand the theory, you'll still have a Basic program that can be used in your own programs.

Scrolling can be defined as the movement of information around the screen when new material appears on one of the edges. For example, each time you list a Basic program the data scrolls on to the screen from the bottom and off at the top. This is a very simple type of scroll and many computer games have far more complex routines.

Arcade games even have more than one level of scrolling to give a 3D depth effect. *Atari User* has already covered the subject of scrolling so there is no need for a full explanation but if you missed the articles they are in volume 1 issues 6 and 7 (October and November 1985).

Basic has no reserved word support for controlling scrolling and so all work has to be done with the PEEK and POKE statements. If the scroll routine is written in Basic and not machine code you will then find it is too slow and the result is a jerky screen with very slow movement.

Machine code is the only answer and in fact the Atari only really excels in performance when programmed in machine code.

Now you've heard the bad news don't get disheartened because this program is designed to help you understand it all. Program I is in Basic and is a scrolling banner routine that works in a DLI.

All you have to do is put your text string into *A$* and call the routine. The machine code finds the text in *A$* and starts a DLI running. This continually takes data from *A$* and scrolls it from right to left. Once this DLI is set up it works on its own and leaves the rest of the processing time for your Basic program.

A couple of small points about the routine are to make sure the text in *A$* is in upper case and terminate it with the @ character. This informs the DLI when to start retrieving data from the start of *A$* again.

This may seem a very easy routine to write but the problem with scrolling is knowing exactly where the screen data is. Basic is not the best language for letting you know this so it makes life a great deal harder.

If you do want to explore scrolling then you should use an assembler as its a lot easier. So let's have a look at the machine code. It's all stored in page 6 – that over-used area of memory which is safe from the friendly memory eating Basic.

Listing II is the source code of the program and creates much smoother scrolling. The display list (label DLIST) is a copy of the GRAPHICS 0 display list with a few alterations.

A DLI bit is set at the beginning to allow for the DLI to take place, then the third blank line is replaced with the scroll line. This is in Antic mode 6 or Graphics 1.

The rest of the screen is the same as it is in the operating system. The code is called at label START and here the address of *A$* is pulled of the stack and the address of the screen is stored into my display list.

Finally the DLI vector is set to point to DLI1 and NMEIN ($D40E) is set to recognise DLIs. Finally the RTS returns the system to Basic. The next routine DLI1 is then called each time Antic finds a DLI bit set in the mode line it is drawing. In our case this is right at the start of the screen.

The DLI itself keeps fine scrolling the scroll line until it needs to do a course scroll when it takes 40 bytes from *A$* and places it on to the scroll line.

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Listing I: Basic Program

```
10 REM ************************
20 REM **    ATARI FX #3     **
30 REM **                    **
40 REM **  SCROLLING BANNER  **
50 REM **                    **
60 REM **         BY         **
70 REM **                    **
80 REM **   RICHARD VANNER   **
90 REM **                    **
95 REM ************************
100 DIM A$(30):GRAPHICS 0
200 OFFSET=0
210 REM
220 REM SET A$ TO YOUR STRING AND
230 REM THEN CALL THE MACHINE CODE
240 REM WITH X=USR(1611,ADR(A$))
250 REM
260 REM REMEMBER A$ MUST END WITH THE
270 REM @ CHARACTER AND ALL TEXT MUST
280 REM BE IN UPPER CASE.
290 REM
300 A$="ATARI USER (C) 1987    @"
310 REM
320 REM READ IN MACHINE CODE AND
330 REM POKE INTO PAGE 6
340 REM
400 READ DAT:IF DAT=-1 THEN GOTO 600
500 POKE
1536+OFFSET,DAT:OFFSET=OFFSET+1:GOTO
400
510 REM
520 REM OK A$ SETUP AND MACHINE CODE
530 REM IN RAM NOW CALL CODE
540 REM
600 X=USR(1611,ADR(A$))
3000 DATA
128,112,112,86,35,6,66,255,255,2,2,2,2
,2,2,2,2,2,2,2,2,2,2,2,2
3010 DATA
2,2,2,2,2,2,2,65,0,6,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0
3020 DATA
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0
3030 DATA
104,104,141,230,6,133,204,104,133,203,
141,229,6,169,7,141,228,6,165,88,141,7
,6,165,89
3040 DATA
141,8,6,169,0,141,48,2,169,6,141,49,2,
169,129,141,0,2,169,6,141,1,2,169,192
3050 DATA
141,14,212,96,120,72,138,72,152,72,206
,228,6,173,228,6,16,73,169,7,141,228,6
,165,203
3060 DATA
133,208,165,204,133,209,160,0,162,0,17
7,208,201,64,208,14,173,229,6,133,208,
173,230,6,133
3070 DATA
209,160,0,177,208,24,105,32,157,35,6,2
00,232,224,39,208,224,230,203,208,2,23
0,204,160,0
3080 DATA
177,203,201,64,208,10,173,229,6,133,20
3,173,230,6,133,204,173,228,6,141,4,21
2,104,168,104
3090 DATA 170,104,64,7,0,0,-1
```

Get it right!

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
10	3811	20	4235	30	3211
40	5219	50	3211	60	3450
70	3211	80	4725	90	3211
95	3811	100	3833	200	1707
210	871	220	5776	230	5771
240	5082	250	871	260	6792
270	6568	280	4143	290	871
300	6828	310	871	320	5451
330	3640	340	871	400	5753
500	9071	510	871	520	6123
530	5040	540	871	600	3577
3000	10009	3010	8016	3020	7912
3030	13530	3040	12014	3050	13716
3060	14266	3070	13752	3080	14266
3090	3896				

Listing II: Machine Code Program

```
0100 ;*****************************
0110 ;*          FX#3             *
0120 ;*       HORIZONTAL          *
0130 ;*    SCROLLING MESSAGE      *
0140 ;*  ASSEMBLER : MAC65 ROM    *
0150 ;*****************************
0160 ;
0170 ;Program equates.
0180 ;
0190 XPLACE = $D0
0200 TEMP =  $CB
0210 ANTIC2 = $02
0220 ANTIC6 = $06
0230 HSCROLL = $10
0240 LMS =   $40
0250 DLI =   $80
0260 WVBI =  $41
0270 VDSLST = $0200
0280 SDLIST = $0230
0290 HSCROL = $D404
0300 ;
0310 ;Set Program run address.
0320 ;
0330     *=  $0600
0340 ;
0350 ;Display List
0360 ;
0370 DLIST .BYTE DLI,$70,$70 ;2 Blank
0380     .BYTE ANTIC6+LMS+HSCROLL
;Graphics 1 Scrolling Message line
0390 SC_POINTER
0400     .WORD SC_40 ;Address
0410     .BYTE ANTIC2+LMS ;Graphics 0
0420 OS_POINTER
0430     .WORD $FFFF ;Screen data
address
0440     .BYTE 2,2,2,2,2,2,2,2,2
0450     .BYTE 2,2,2,2,2,2,2,2,2,2
0460     .BYTE 2,2,2,2
0470     .BYTE WVBI  ;Jump+Wait
0480     .WORD DLIST ;Address
0490 SC_40 .BYTE 0,0,0,0,0,0,0,0,0,0
0500     .BYTE 0,0,0,0,0,0,0,0,0,0
0510     .BYTE 0,0,0,0,0,0,0,0,0,0
0520     .BYTE 0,0,0,0,0,0,0,0,0,0
0530 ;
0540 ;Start of code.
0550 ;
0560 START PLA
0570     PLA
0580     STA STRING+1
0590     STA TEMP+1
0600     PLA
0610     STA TEMP
0620     STA STRING
0630     LDA #7
0640     STA YFINE
0650     LDA 88
0660     STA OS_POINTER
0670     LDA 89
0680     STA OS_POINTER+1
0690 ;
0700 ;Set Display List Pointer
0710 ;To Point to my DLIST.
0720 ;
0730     LDA # <DLIST
0740     STA SDLIST
0750     LDA # >DLIST
0760     STA SDLIST+1
0770 ;
0780 ;Set DLI Pointer
0790 ;
0800     LDA # <DLI1
0810     STA VDSLST
0820     LDA # >DLI1
0830     STA VDSLST+1
0840 ;Tell Antic to accept DLI lines
0850     LDA #$C0
0860     STA $D40E
0870     RTS
0880 ;
0890 ;Display List Interrupt.
0900 ;
0910 DLI1
0920     SEI
0930     PHA
0940     TXA
0950     PHA
0960     TYA
0970     PHA
0980 ;
0990     DEC YFINE
1000     LDA YFINE
1010     BPL DLI5
1020     LDA #7
1030     STA YFINE
1040     LDA TEMP
1050     STA XPLACE
1060     LDA TEMP+1
1070     STA XPLACE+1
1080 DLI2 LDY #0
1090     LDX #0
1100 DLI3 LDA (XPLACE),Y
1110     CMP #'@
1120     BNE DLI4
1130     LDA STRING
1140     STA XPLACE
1150     LDA STRING+1
1160     STA XPLACE+1
1170     LDY #0
1180     LDA (XPLACE),Y
1190 DLI4
1200     CLC
1210     ADC #$20
1220     STA SC_40,X
1230     INY
1240     INX
1250     CPX #39
1260     BNE DLI3
1270     INC TEMP
1280     BNE DLI6
1290     INC TEMP+1
1300 DLI6 LDY #0
1310     LDA (TEMP),Y
1320     CMP #'@
1330     BNE DLI5
1340     LDA STRING
1350     STA TEMP
1360     LDA STRING+1
1370     STA TEMP+1
1380 DLI5
1390     LDA YFINE
1400     STA HSCROL
1410     PLA
1420     TAY
1430     PLA
1440     TAX
1450     PLA
1460     RTI
1470 YFINE .BYTE 7
1480 STRING .WORD 0
```

TECHNOLOGY SO ADVANCED ...



MEMORY
* 512Kbytes RAM (520ST-M, FM)
* 1024Kbytes RAM (1040ST-F)
* 192Kbytes ROM
* 128Kbytes external plug-in ROM option

ARCHITECTURE
* Motorola 68000 Central Processing Unit (CPU) with a clock speed of 8MHz
* 16-bit external data bus
* 32-bit internal data bus
* 24-bit address bus
* 8×32-bit data & address registers
* 7 levels of interrupts
* 56 instructions
* 14 addressing modes
* 5 data types
* DMA (Direct Memory Access)
* real time clock as standard

GRAPHICS
* full bit-mapped display
* palette of 512 colours

Using Atari Monitors (on 520 & 1040):
* 640×400 high resolution - monochrome
* 640×200 medium resolution - 4 colours
* 320×200 low resolution - 16 colours
* 80 column text display (40 col low res)

Using Domestic TV (on 520):
* 640×200 medium resolution - 4 colours
* 320×200 low resolution - 16 colours
* 40 columns × 25 line text display

SOUND AND MUSIC
* 3 programmable sound channels
* frequency programmable 30Hz - 125KHz
* programmable volume
* wave & dynamic envelope shaping
* programmable attack, decay, sustain, release
* Musical Instrument Digital Interface (MIDI)
* MIDI allows connection of synthesisers etc.

MOUSE
* high precision
* 2 button control
* free with 520ST-FM/1040ST-F
* non slip ball motion sensor
* removable ball for easy cleaning

STANDARD SOFTWARE
* GEM desktop + TOS operating system
* ST BASIC interpreter/language system

INPUT/OUTPUT
* MIDI out .... (5 pin DIN) 31.25K baud
* MIDI in .... (5 pin DIN) 31.25K baud
* audio out .. 1.0V DC peak to peak, 10K ohm
* audio in .... 1.0V DC peak to peak, 10K ohm
* RGB monitor .... 1.0V DC, 75 ohm
* mono monitor .... 1.0V DC, 75 ohm
* mono horizontal scan rate 35.7KHz
* mono vertical scan rate 71.2KHz
* sync .... 5V DC (active low) 3.3K ohm
* modem/serial .... RS232C, 50 to 19,200 baud
* floppy disk .... 250 Kbits/s
* hard disk .... 11.3 Mbits/s
* mouse .... standard Atari connector
* joystick .... standard Atari connector
* cartridge port .... 128K capacity
* RF output (520ST-FM) .... for TV use

OPERATING SYSTEM
* TOS with GEM environment in ROM
* hierarchical file structure with sub-directories and path names
* user interface via GEM, with self explanatory command functions
* multiple windows + icons
* window resizing, re-positioning and erasing
* drop down menus (selected by mouse)
* GEM virtual device interface

COMMUNICATIONS
* RS-232C serial modem port
* 8-bit parallel printer port
* MIDI port (also for networking use)
* VT52 terminal emulation

KEYBOARD
* standard QWERTY typewriter format
* 95 full stroke keys
* 10 function keys
* 18 key numeric keypad + cursor keys
* variable auto-repeat & key click response
* keyboard processor reduces CPU overhead

... IT'S AFFORDABLE

ONLY FROM SILICA

Finally, there's a personal computer that not only solves problems like other computers, but also solves the one problem that other computers have created. Affordability. Silica Shop are pleased to present the ST range of personal/business computers from Atari. The ST was designed utilizing the most recent breakthroughs in semiconductor technology, producing a personal computer that performs tasks with fewer parts. Which means it costs less to make. And less to buy. The latest ST computers now include built in power supplies and built in disk drives. The TOS operating system and GEM window environment are now on ROM chips which are already installed in the ST keyboard. This enables automatic instant booting when you switch on. Silica Shop are pleased to offer the complete Atari ST range. Our mail order department is situated in Sidcup and we have 4 retail outlets at Sidcup, Orpington, Lion House (Tottenham Court Rd) and Selfridges (Oxford Street). We have eight years experience of Atari products, longer than any other UK company, and are well established as the UK's No.1 Atari specialist. With a group turnover of over £5 million and in excess of 70 staff, we provide unbeatable service and support. We provide several facilities which you will find invaluable during your Atari computing life and most of these facilities are available **ONLY FROM SILICA**. We suggest that you read through what we have to offer, before you decide where to purchase your Atari ST.

FREE STARTER KIT - Only From Silica
When you purchase any Atari ST keyboard, you will not only receive the best value for money computer on the market, but you will also receive the following from Atari Corporation as part of the package:

** BASIC Language Disk * BASIC Manual * ST Owners Manual * TOS/GEM on ROM*

If you buy your ST from Silica Shop, you will also receive:

** NEOchrome - colour graphics program * 1st Word - Word Processor*

In addition, we at Silica would like to see you get off to a flying start with your new computer, so we have put together a special **ST STARTER KIT** worth over £100, which we are giving away **FREE OF CHARGE** with every ST computer purchased at our normal retail prices. This kit is available **ONLY FROM SILICA** and is aimed at providing users with a valuable introduction to the world of computing. We are continually upgrading the ST Starter Kit, which contains public domain and other licensed software, as well as books, magazines and accessories all relevant to ST computing. Return the coupon below for full details.

DEDICATED SERVICING - Only From Silica
At Silica Shop, we have a dedicated service department of five full time Atari trained technical staff. This team is totally dedicated to servicing Atari computer products. Their accumulated knowledge, skill and experience makes them second to none in their field. You can be sure that any work carried out by them is of the highest standard. A standard of servicing which we believe you will find **ONLY FROM SILICA**. In addition to providing full servicing facilities for Atari ST computers (both in and out of warranty), our team is also able to offer memory and modulator upgrades to ST computers.

1Mb RAM UPGRADE: Our upgrade on the standard Atari 520ST-M or 520ST-FM keyboard will increase the memory from 512K to a massive 1024K. It has a full 1 year warranty and is available from Silica at an additional retail price of only £86.96 (+VAT = £100).

TV MODULATOR UPGRADE: Silica can upgrade the 1040ST-F to include a TV modulator so that you can then use it with your TV set. This is an internal upgrade and does not involve any untidy external boxes. A cable to connect your ST to any domestic TV is included in the price of the upgrade which is only £49 (inc VAT). The upgrade is also available for early 520ST computers at the same price.

THE FULL STOCK RANGE - Only From Silica
We aim to keep stocks of all Atari related products and our warehouse carries a stock of £½ million. We import many software titles direct from the USA and you will find that we have new releases in advance of many of our competitors. Unlike dealers who may only stock selected titles, we have the full range. In addition, we carry a complete line of all books which have been written about the Atari ST. A range as wide as ours is something you will find is available **ONLY FROM SILICA.**

AFTER SALES SUPPORT - Only From Silica
Rest assured that when you buy your ST from Silica Shop, you will be fully supported. Our free mailings give news of releases and developments. This will help to keep you fully up to date with what's happening in the Atari market. And in addition, our sales staff are at the end of a telephone line to service all of your Atari requirements. If you purchase an ST from Silica and would like any programming or technical advice, we have a full time technical support team to help you get the best from your computer. Because we have both the staff and the systems specifically dedicated to providing after sales service on Atari ST computers, we are confident that our users enjoy an exceptionally high level of support. This can be received **ONLY FROM SILICA**.

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At Silica Shop, we recognise that serious users require an in-depth information service, which is why we mail free newsletters and price lists to our ST owners. These are up to 48 pages long and are crammed with technical details as well as special offers and product descriptions. If you have already purchased an ST and would like to have your name added to our mailing list, please complete the coupon & return it to us. The information service is available **ONLY FROM SILICA**.

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We hope that the combination of our low prices, FREE UK delivery service, FREE Starter Kit and FREE after sales support, will be enough to make you buy your Atari equipment from Silica Shop. If however, there is something you wish to purchase, and you find one of our competitors offering it at a lower price, then please contact our sales department, providing us with our competitor's name, address and telephone number. If our competitor has the goods in stock, we will normally match the offer (on a 'same product - same price' basis) and still provide you with our normal free delivery. We realise that we are not the only company who will match a competitor's price. However, if you come to us for a price match, you will also be entitled to our after sales service, including free newsletters and technical support. This makes our price match promise rather special, something you will receive **ONLY FROM SILICA**. We don't want you to go anywhere else for your Atari products. So shop at Silica, the UK's No1 Atari Specialist.

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LONDON .... **01-629 1234 ext 3677**
Selfridges (1st floor), Oxford Street, London, W1A 1AB

520ST-M
The affordability of Atari computers is reflected in the price of the 520ST-M keyboard, which is a mere £259 (inc VAT). This version of the ST comes with 512K RAM, as well as a modulator and lead for direct connection to any domestic TV. The price does not include a mouse. In addition, when you buy your 520ST-M from Silica, you will also receive the FREE Silica 'ST Starter Kit'. During 1987, many software houses will be producing games software on ROM cartridges, which will plug directly into the cartridge slot on the 520ST-M keyboard, giving instant loading without the expense of purchasing a disk drive. With the enormous power of the ST, you can expect some excellent titles to be produced, making this the ultimate games machine! If your requirement is for a terminal, then the 520ST-M can fulfill this role too. Leads are available to connect the ST to a variety of monitors, and with the imminent introduction of terminal software on ROM cartridge, the ST provides a low price terminal for business use. If you wish to take advantage of the massive range of disk software available for the ST range, you will need to purchase a disk drive. Atari have two floppy disk drives available, a ½ Mbyte model £149 and a 1Mbyte model £199. Full details of these drives, as well as the Atari 20Mbyte hard disk are available on request. If required at a later date, the mouse may be purchased separately.

£259

520ST-FM
The 520ST-FM with 512K RAM and free mouse, represents a further breakthrough by Atari Corporation in the world of high power, low cost personal computing. This model is the latest addition to the ST family, and is not only powerful, but compact. It is priced at only £399 (inc VAT) a level which brings it within the reach of a whole new generation of computer enthusiasts. When purchased from us, it comes with the FREE Silica 'ST Starter Kit' see paragraph on the left. To make the 520ST-FM ready for use straight away, Atari have built into the keyboard a ½ megabyte disk drive for information storage and retrieval, allowing you easy access to the massive range of disk based software which is available for the ST. This new computer comes with all the correct cables and connections you will need to plug it straight into any standard domestic television set. You do not therefore have to purchase an Atari monitor. If you do require a monitor however, these are available with the 520ST in the following money saving packages:

520ST-FM Keyboard Without Monitor	*- **£399** (inc VAT)*
520ST-FM Keyboard + High res mono monitor	*- **£499** (inc VAT)*
520ST-FM Keyboard + Low res colour monitor	*- **£599** (inc VAT)*
520ST-FM Keyboard + Med res colour monitor	*- **£699** (inc VAT)*

Because the 520ST-FM has its own power transformer built into the keyboard, there are no messy external adaptors to clutter up your desk space. You are left with only one mains lead, serving both the disk drive and the computer. You couldn't ask for a more stylish and compact unit.

£399

1040ST-F
For the businessman and the more serious home user, Atari have their most powerful model, the 1040ST-F with 1028K RAM. This low cost powerhouse can be introduced into a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The 1040ST-F not only features twice as much memory as the 520ST-FM, but also includes a more powerful built-in disk drive. The drive featured on the 1040ST-F is a one megabyte double sided model. The extra memory facility of the 1040ST-F makes it ideal for applications such as large databases or spreadsheets. Like the 520ST-FM, the 1040ST-F has a mains transformer built into the console to give a compact and stylish unit with only one mains lead. The 1040ST-F is also supplied from Silica Shop with a free software package and 'ST STARTER KIT'. In the USA, the 1040ST-F has been sold with a TV modulator like the 520ST-FM. However, for the UK market, Atari are manufacturing the 1040ST-F solely with business use in mind and it does not currently include an RF modulator, this means that you cannot use it with a domestic TV (Silica Shop do offer a modulator upgrade for only £49). The 1040ST-F keyboard costs only £599 (inc VAT) and, unless a modulator upgrade is fitted, will require an Atari or third party monitor. There are three Atari monitors available and the prices for the 1040 with these monitors are as follows:

1040ST-F Keyboard Without Monitor	*- **£599** (inc VAT)*
1040ST-F Keyboard + High res mono monitor	*- **£699** (inc VAT)*
1040ST-F Keyboard + Low res col monitor	*- **£799** (inc VAT)*
1040ST-F Keyboard + Med res col monitor	*- **£899** (inc VAT)*

The 1040ST-F comes with a mouse controller and includes 1Mbyte of RAM. It has a 1Mbyte double sided disk drive and mains transformer, both built into the keyboard to give a compact and stylish unit, with only one mains lead.

£599

ATARI ST

To: Silica Shop Ltd, Dept ATUSR 0987, 1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX

PLEASE SEND ME FREE LITERATURE ON THE ATARI ST

Mr/Mrs/Ms: .... Initials: .... Surname: ....

Address: ....

Postcode: ....

Do you already own a computer
If so, which one do you own? ....

5 LINERS

G.A.D. PICTURE LOADER.
from Granville Danby

HAVE you ever written a program and wished you could create fancy title screens like some of the commercial software available? With this program you can load in picture files created on Graphics Art Department.

The package contains an art show, but unfortunately it won't let you use the pictures within your own programs. This five-liner uses a machine code routine to load and display G.A.D. files that are saved in uncompressed format – 31 sectors long with the first 5 Bytes representing the colour registers. To use this listing within your own program just change FN$ in line 10 to the filename of the picture you will want to load. You could even adapt the routine to create a continuous art show within your own program.

ASSEMBLY LISTING
START ADDR=0600END ADDR = 061F

```
0600  A9 07       LDA #$07
0602  A2 10       LDX #$10
0604  9D 42 03    STA ICCOM0,X
0607  A5 58       LDA SAVMSC
0609  9D 44 03    STA ICBAL0,X
060C  A5 59       LDA $59
060E  9D 45 03    STA ICBAH0,X
0611  A9 3C       LDA #$3C
0613  9D 49 03    STA ICBLH0,X
0616  A9 00       LDA #$00
0618  9D 48 03    STA ICBLL0,X
061B  20 56 E4    JSR CIOV
061E  68          PLA
061F  60          RTS
```

PROGRAM BREAKDOWN
- **10** Opens file to disc
- **20** Gets colour register information
- **30** Reads and Pokes in machine data
- **40** Endless loop
- **50** Machine code data

PROGRAM VARIABLES
- **FN$** Picture Filename
- **C1 – C5** Colour Register Information

```
10 DIM FN$(15):FN$="D:PICTURE.PIC":OPE
N #1,4,0,FN$:GRAPHICS 7+16
20 GET #1,C1:GET #1,C2:GET #1,C3:GET #
1,C4:GET #1,C5:POKE 708,C1:POKE 709,C2
:POKE 710,C3:POKE 712,C5
30 FOR Y=0 TO 31:READ X:POKE 1536+Y,X:
NEXT Y:Q=USR(1536):CLOSE #1
40 GOTO 40
50 DATA 169,7,162,16,157,66,3,165,88,1
57,68,3,165,89,157,69,3,169,60,157,73,
3,169,0,157,72,3,32,86,228,104,96
```

Get it right!

LINE CHSUM	LINE CHSUM	LINE CHSUM
10 10996	20 16804	30 11595
40 1422	50 16215	

MINI-PACMAN
from Robin Edwards

HERE'S a version of an old arcade classic. When you run the program a matrix of dots (power pills) is drawn on the screen and you're asked for the level of play – 1 is easy and 9 is impossible. Your man appears at the top left of the screen and the ghost at the bottom right. It will automatically start homing in on you.

The object of the game is to eat all 100 of the power pills to give you enough strength to be able to eat the ghost. Movement of your man is via the joystick plugged into port 1. Due to the length of certain lines the commands within them must be shortened as you type them in.

```
10 ? "LEVEL(1-9)":INPUT E:GRAPHICS 0:P
OKE 752,1:X=0:Y=0:T=0:A=9:B=9:FOR Z=0
TO 9:POSITION 0,Z:? "..........":NEXT
Z
20 LOCATE X,Y,C:LOCATE A,B,D:POSITION
X,Y:? "■":POSITION A,B:? "■":S=STICK(0
):IF C=46 THEN SOUND 0,100,10,10:C=32:
T=T+1
30 X1=(S=7 AND X<9)-(S=11 AND X>0):Y1=
(S=13 AND Y<9)-(S=14 AND Y>0):X=X+X1:Y
=Y+Y1:SOUND 0,0,0,0:POSITION 11,0:? T
40 POSITION X-X1,Y-Y1:? CHR$(C):POSITI
ON A,B:? CHR$(D):IF RND(0)<E/10 THEN A
=A+(X>A)-(X<A):B=B+(B<Y)-(B>Y)
50 ON (X=A)+(Y=B)<>2 GOTO 20:POSITION
2,11:? "GAME OVER":POSITION 2,12+(T=10
0):? "You Win!":POSITION 2,12:? "
   ":? :? :RUN
```

PROGRAM BREAKDOWN
- **10** Draws. Matrix, gets skill level, turns of cursor.
- **20** Draws ghost and man and checks joystick. Makes beep.
- **30** Moves man, writes score and stops beep.
- **40** Moves ghost.
- **50** Check for collision. Game over routine.

TYPING-IN NOTES
- **10** Abbreviate GRAPHICS 0 to GR.0
- **20** Abbreviate POSITION to POS.
- **30** Type it in as it appears
- **40** Type it in as it appears
- **50** Abbreviate all POSITIONS to POS. and miss all spaces out. There are eight spaces between the quotes

Get it right!

LINE CHSUM	LINE CHSUM	LINE CHSUM
10 20012	20 22272	30 19764
40 18708	50 23123	

Win £25

IF you've written any useful or interesting five line programs why not send them to us to grace our pages?

You should give a full description of the routine and any other details that are relevant.

If you want your material returning please enclose a suitably stamped package.

We pay £25 for each one published.

Simply send a copy of the program on disc or tape together with the documentation – preferably as a word processed file – to:

Atari User, Europa House, 68 Chester Road, Hazel Grove, Stockport, SK7 5NY.

ORGAN II
from Andy Wood

IN the July 1987 issue of *Atari User* there was a Five liner called Organ by Len Golding. Well here is another based on that program but with some added features. As with Organ it uses the internal key code for the character pressed but it also uses the underused string array for storage of the pitch values. This shortens the program space and allows the use of semitones within it. A FOR..NEXT loop adds more realism to the decay of any given note and for a little added fun, the colour register 710 is poked when a key is pressed.

PROGRAM BREAKDOWN

10 Sets trap to line 10 and CLR in case of a wrong key input. Location 729 is poked with 1 to speed the delay between key hit and key repeat.

20 Internal key code placed into P. Value of ASC(n$(P,P)) is placed into N. Location 764 is poked with 255 before the setup of a FOR...NEXT loop to detect a key press during decay.

30 Sets sound channel 1 to use N for pitch and V for volume. But sound 2 is optional. Also colour register 710 is poked.

40 Waits for key press before continuing.

50 Sets up screen.

```
10 CLR :TRAP 10:DIM N$(56):N$="♥♥♥♥♥♥♥
/♥-(+5(U♥♥♥♥♥♥♥♥♥U♥♥D♥L fr♥♥♥♥♥♥♥♥♥Q♥[eyH
♦12♥♥♥!9▪%":POKE 729,1:GOTO 50
20 P=PEEK(764):N=ASC(N$(P,P)):POKE 764
,255:FOR V=15 TO 0 STEP -0.3:ON PEEK(7
64)<255 GOTO 20
30 SOUND 1,N,10,V:SOUND 2,N+1,10,V:POK
E 710,8+16*INT(V):NEXT V
40 ON PEEK(764)<255 GOTO 20:GOTO 40
50 GRAPHICS 18:? #6;" electronic organ
 2      by andy wood":POSITION 3,7:? #6
;"FOR ATARI USER":GOTO 40
```

PROGRAM VARIABLES

P: Internal key code used to locate character in N$.
V: Volume in FOR . . . NEXT loop.

Get it right!

LINE CHSUM	LINE CHSUM	LINE CHSUM
10 13327	20 15492	30 11351
40 5750	50 31214	

FAST MOVER
from Peter Dean

FAST mover is a program designed to move data a page at a time between specific areas of memory. Occupying just 43 bytes it makes use of the indirect Y addressing mode of the 6502 microprocessor.

Furthermore, the program can gain access to the 8k area of ram beneath Basic rom by a process known as bank-switching. The area begins at location 40960 and allows plenty of data to be stored for later retrieval without affecting user ram.

Unfortunately, the routine uses location 54017 and so is incompatable with the old 400/800 series of Atari computers. When you type the program in make sure you save it first before you run it as it uses a machine code routine placed in page 6 so if the data is typed in wrongly then it may crash and lose your program.

When you call the routine the following parameters must be passed to the stack – The address of the machine-code (which is relocatable and can be stored in a string), the address of the data to be moved, where in memory it will finish up and the number of pages involved (one page equals 256 bytes). So the following expression-does all the work:

```
X=USR(1536,from,to,number of pages to
move)
```

Finally a word of warning: When you use fast mover make sure the area of memory to which the data is sent is not required for any other application.

```
10 FOR A=1536 TO 1578:READ B:POKE A,B:
NEXT A
20 DATA 160,0,169,255,141,1,211,104,10
4,133,105,104,133,204,104
30 DATA 133,207,104,133,206,104,104,17
0,177,204,145,206,200
40 DATA 208,249,230,205,230,207,202
50 DATA 208,242,169,253,141,1,211,96
```

Get it right!

LINE CHSUM	LINE CHSUM	LINE CHSUM
10 7527	20 9091	30 8492
40 4973	50 5216	

AT LAST! Small ads in...

ATARI USER

We've received a growing number of demands from our readers to include a Sales and Wants section in *Atari User*. Now you can advertise your unwanted Atari products to our 100,000 readers – all of whom are always looking out for a bargain.

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CHOPPER RESCUE



ON a mission into an enemy country five of your marines have been capsized into the sea and you have to fly in to rescue them. You have one of the fastest super helicopters, equipped with the latest armament, and your task is to rescue the men as they struggle ashore.

This may sound easy but you have limited fuel and an enemy bomber is covering the area dropping bombs and large rocks in an attempt to destroy your helicopter and stop the rescue.

Your helicopter is controlled by the joystick plugged into port one and you fire by moving it in the appropriate direction and pressing fire. By shooting downwards you can blast a tunnel to the trapped men.

Once a passage is clear you can move the helicopter through the narrow tunnel. You pick a man up by positioning your helicopter over the man and once he has boarded the craft you fly him to the safe landing platform on the left of the screen.

Watch for the plane which is dropping rocks and bombs – shoot it if you can. Once you touch down on the pad the man will jump out and you can return to rescue the next one. Remember, you can only collect one man at a time.

You start the game with three lives and lose one if you are hit by a bomb or rock or if you crash into any other object on the screen.

The men can also be killed by the bombs and rocks. It's okay to land on a dead man but not surprisingly, you cannot pick him up. If you crash when carrying a man he dies and you lose a life.

There are 10 screens on the first level and you have to collect five men on each one. When these screens have been completed you move to level two where you have to rescue six men... and so on.

After 10 levels the game restarts at level one, but this time considerably faster.

SCORE TABLE

Action	Score
Shooting soil or rocks	1
Picking man up	30
Shooting the bomber	50
Taking man to safety	60
Shooting falling bomb or rock	100

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PROGRAM BREAKDOWN

100-280	Main loop
300-350	Fire routine
360-390	Reduce fuel
400-450	Move aeroplane
500-570	Button pressed-fire rockets
600-760	Explode helicopter
800-890	Collision detection
900-990	Bullet collision detection
1000-1070	Explosion routines
1100-1180	Falling bomb and rock routine
1200-1310	Bomb or rock landed
1320-1400	Update score
1410-1470	Pick up man routine
1500-1570	Drop man on safe pad
1580-1730	New level
1750-1850	Bullet hits bomb or rock
1860-1890	Man dies
1900-1980	Tune for completing level
2000-2090	Aeroplane hit routine
3000-3170	Game over
4000-4990	Draw levels
5000-5600	Player missiles and VBI routines
5610-5990	Initialise variables
5990-6180	Poke new character set data
6190-6290	Display list interrupt

VARIABLES

DIFF	Difficulty of each level
D	Man killed variable
LEV	Holds current screen level
LIM	Number of men left to rescue
MR	Number of men rescued
FU	Fuel limit
MAN	Men rescued on particular level
CM	If you have man CM=1 or 0 otherwise
SC	Score
HI	High score
LI	Lives left
F	Has bullet been fired flag
SO	Noise parameter for explosion
B	Bomb drop flag
P	Plane move flag
I, M	For next loop counters
CLEAR	Clear out for player/missiles
L	Load player missiles
PM	PMG's memory address
CHSET	New characters memory address
A	Dummy variable for reading data
N$/S$	Display scores
S	Variable for joystick read
X,Y,Z	Used for locate function
DL	Start of display list
ST	Falling object status
X1/Y1	Location of PMGs on screen

◀ ***From Page 47***

```
10 REM CHOPPER RESCUE
20 REM BY GEOFFREY STOREY
30 REM (c) ATARI USER
40 REM
50 GRAPHICS 0:DIM N$(10),S$(10):? " SETTING-UP PLEASE WAIT....";
60 FOR I=0 TO 900:NEXT I:POKE 559,0
70 GOSUB 5000:GOSUB 6000
80 GOSUB 4000
90 A=USR(1536):FOR I=0 TO 3:A=USR(CLEAR,I):NEXT I:POKE 53278,0:POKE 559,62
100 REM *** MAIN LOOP ***
110 POKE 77,0
120 FOR SP=0 TO 4
130 A=USR(L,0,PM+20)
140 IF F=0 AND STRIG(0)=0 THEN GOSUB 500
150 IF F=1 THEN GOSUB 300
160 IF PEEK(1558)>230 THEN GOSUB 400
170 IF B=0 AND P=1 AND PEEK(53770)>DIFF THEN GOSUB 1100
180 GOSUB 800
190 A=USR(L,0,PM+40)
200 IF PEEK(1556)<45 THEN POKE 1556,205
210 IF PEEK(1556)>205 THEN POKE 1556,45
220 IF B=1 AND PEEK(1563)>200 THEN B=0:SOUND 3,0,0,0
230 IF B=1 THEN SOUND 3,PEEK(1563)+4,10,6
240 IF F=0 AND STRIG(0)=0 THEN GOSUB 500
250 IF F=1 THEN GOSUB 300
260 NEXT SP
270 GOSUB 370
280 GOTO 110
300 REM *** FIRE ROUTINE ***
310 IF PEEK(53253)>2 THEN POKE 1585,0:GOSUB 900:GOTO 890
320 IF PEEK(1557)>205 OR PEEK(1561)<49 OR PEEK(1561)>209 THEN 340
330 RETURN
340 A=USR(CLEAR,1):POKE 1585,0:SOUND 1,0,0,0:F=0
350 RETURN
360 REM *** REDUCE FUEL ***
370 FU=FU-1:N$=STR$(FU):S$="000"
380 S$(4-LEN(N$))=N$:POSITION 5,22:? #6;S$:IF  NOT FU THEN POP :GOTO 3000
390 RETURN
400 REM *** MOVE PLANE ***
410 A=USR(CLEAR,2):POKE 1586,0:P=1
420 POKE 1558,0:SOUND 2,0,0,0
430 IF INT(RND(0)+0.5)=0 THEN POKE 1558,30:A=USR(L,2,PM+103):POKE 1586,7:GOTO 450
440 POKE 1558,230:A=USR(L,2,PM+123):POKE 1586,8
450 SOUND 2,80,4,4:RETURN
500 REM *** BUTTON PRESSED ***
510 S=STICK(0):IF S=15 THEN RETURN
520 POKE 1585,S
530 POKE 1557,PEEK(1556)
540 POKE 1561,PEEK(1560)+3
550 A=USR(L,1,PM+83):SOUND 1,2,0,6
560 F=1
570 RETURN
600 REM *** CRASH ROUTINE ***
610 A=USR(1546):LI=LI-1:B=0:F=0:T=0
620 POSITION 16+LI,0:? #6;" "
630 FOR I=0 TO 3:SOUND I,0,0,0:NEXT I
640 GO=1000:P=0
650 FOR I=1 TO 6
660 GO=GO+10:SO=SO+1
670 GOSUB GO
680 FOR M=1 TO 50:NEXT M
690 NEXT I
700 FOR I=0 TO 20:NEXT I
710 IF LI=0 THEN POP :GOTO 3000
720 POKE 1556,52
730 POKE 1560,173
740 POKE 53278,0
750 IF CM=1 THEN CM=0:GOSUB 1860
760 POP :GOTO 90
800 REM *** DETECT COLLISION ***
810 IF PEEK(53252)>3 THEN 600
820 IF PEEK(53263)=2 THEN GOSUB 1750
830 IF PEEK(53255)>0 THEN GOSUB 1200
840 IF PEEK(53260)>2 THEN 600
850 IF PEEK(53252)=2 THEN GOSUB 1400
860 IF PEEK(53252)=1 THEN GOSUB 1500
870 IF PEEK(53261)=4 THEN GOSUB 2000
880 IF PEEK(53253)>2 THEN POKE 1585,0:GOSUB 900
890 POKE 53278,0:RETURN
900 REM *** BULLIT HIT SOIL/ROCK ***
910 POKE 1585,0:F=0:SOUND 1,0,0,0
920 A=USR(CLEAR,1):POKE 53278,0
930 X1=PEEK(1557):Y1=PEEK(1561)
940 X=INT(X1-48)/8:Y=INT(Y1-44)/8
941 IF X>19 THEN X=19
942 IF X<0 THEN X=0
943 IF Y>20 THEN Y=20
944 LOCATE X,Y,Z
945 IF Z=4 OR Z=33 THEN RETURN
950 POSITION X,Y:? #6;CHR$(165)
960 FOR I=100 TO 200 STEP 20
970 SOUND 0,I,0,15-INT((I-100)/6.66)
980 NEXT I:SC=SC+1
990 POSITION X,Y:? #6;" ":GOTO 1320
1000 REM *** EXPLOSION ROUTINE ***
1010 SOUND 0,240,0,SO:A=USR(L,T,PM+180):RETURN
1020 SOUND 0,240,0,SO:A=USR(L,T,PM+184):RETURN
1030 SOUND 0,240,0,SO:A=USR(L,T,PM+190):RETURN
1040 SOUND 0,240,0,SO:A=USR(L,T,PM+200):RETURN
1050 POKE 53256+T,1:SOUND 0,240,0,SO:A=USR(L,T,PM+220):RETURN
1060 A=USR(CLEAR,T):POKE 53256+T,0
1070 SOUND 0,0,0,0:SO=7:RETURN
1100 REM *** DROP BOMB/ROCK ***
1110 IF PEEK(1558)<48 OR PEEK(1558)>200 THEN RETURN
1120 A=USR(CLEAR,3):POKE 1587,0:SOUND 3,0,0,0:B=1
1130 IF INT(RND(0)+0.5)=0 THEN ST=140:POKE 707,6:POKE 1579,PEEK(1578):GOTO 1150
1140 ST=160:POKE 1579,PEEK(1578)+2:POKE 707,136
1150 POKE 1559,PEEK(1558)
1160 POKE 1563,PEEK(1562)+8
1170 A=USR(L,3,PM+ST):POKE 1587,1
1180 RETURN
1200 REM *** BOMB/ROCK LANDED ***
1210 IF PEEK(1559)<48 OR PEEK(1559)>200 THEN 1300
1220 POKE 1587,0
1230 IF ST=140 THEN 1270
1240 T=3:GO=1000
1250 FOR I=1 TO 6:GO=GO+10:SO=SO+1:GOSUB GO
1260 NEXT I
```

```
1270 X1=PEEK(1559):Y1=PEEK(1563)
1280 X=INT(X1-48)/8:Y=INT(Y1-44)/8
1281 LOCATE X,Y,Z
1282 IF Z=4 THEN POSITION X,Y:? #6;CHR
$(7):GOSUB 1860:GOTO 1300
1283 IF Z=33 AND ST=140 THEN 1300
1286 IF ST=160 THEN 1300
1290 POSITION X,Y:? #6;CHR$(134)
1300 A=USR(CLEAR,3)
1310 SOUND 3,0,0,0:B=0:RETURN
1320 REM *** SCORE UP-DATE ***
1330 N$=STR$(SC)
1340 S$="00000":S$(6-LEN(N$))=N$
1350 POSITION 0,0:? #6;S$
1360 IF SC>HI THEN HI=SC
1370 N$=STR$(HI)
1380 S$="00000":S$(6-LEN(N$))=N$
1390 POSITION 7,0:? #6;S$:RETURN
1400 REM *** PICK UP MAN ***
1410 IF CM=1 THEN RETURN
1420 X1=PEEK(1556):Y1=PEEK(1560)
1430 X=INT(X1-48)/8:Y=INT(Y1-44)/8
1435 IF X>19 THEN X=19
1440 LOCATE X,Y+1,Z:IF Z<>4 THEN RETUR
N
1450 POSITION X,Y+1:? #6;" "
1460 CM=1:SC=SC+30
1470 GOTO 1320
1500 REM *** THE HELIPAD ***
1510 IF MAN=LIM-D THEN 1560
1520 IF CM=0 THEN RETURN
1530 A=USR(CLEAR,1):POKE 1577,1:POKE 1
557,PEEK(1556):POKE 1561,175:POKE 705,
200:A=USR(L,1,PM+60)
1540 POKE 1585,11:FOR I=0 TO 25:NEXT I
:A=USR(CLEAR,1):POKE 705,238:POKE 1577
,3:SC=SC+60:MR=MR+1:CM=0:MAN=MAN+1
1550 POSITION 16,22:? #6;MAN
1560 IF MAN=LIM-D THEN POP :GOTO 1590
1570 POKE 53278,0:GOTO 1320
1580 REM *** NEW LEVEL ***
1590 A=USR(L,0,PM):A=USR(1546):FOR I=0
 TO 3:SOUND I,0,0,0:NEXT I
1600 POSITION 0,3:? #6;" WAVE ";LEV;"
COMPLETE"
1610 LIM=LIM+1:MAN=0:CM=0:B=0
1620 GOSUB 1900
1630 LEV=LEV+1:IF LEV=11 THEN LEV=1:PO
KE 1578,PEEK(1578)+1:LIM=5:LI=LI+1
1640 D=0:P=0:F=0:DIFF=DIFF-10
1650 FOR M=1 TO 100:FU=FU+1:SOUND 0,20
,10,10
1660 N$=STR$(FU):S$="000":GOSUB 380
1670 SC=SC+5:GOSUB 1320
1680 SOUND 0,0,0,0:NEXT M
1690 FOR I=0 TO 100:NEXT I
1700 ? #6;CHR$(125):POKE 559,0
1710 GOSUB 4040
1720 POKE 1556,52:POKE 1560,173
1730 POP :GOTO 90
1750 REM *** BULLIT HIT BOMB/ROCK ***
1760 POKE 1585,0:POKE 1587,0:SOUND 1,0
,0,0:SOUND 3,0,0,0
1770 F=0:B=0:A=USR(CLEAR,1):A=USR(CLEA
R,3)
1780 A=USR(L,3,PM+240)
1790 FOR I=15 TO 0 STEP -1:FOR M=0 TO
5:SOUND 0,M*10+I,10,I:POKE 707,M*10+I:
A=USR(L,0,PM+20):NEXT M
1800 SOUND 0,0,0,0
1810 A=USR(L,0,PM+40)
1820 NEXT I
1830 A=USR(CLEAR,3)
1840 POKE 53278,0
1850 SC=SC+100:GOTO 1320
1860 REM *** MAN DEAD ***
1870 D=D+1
1880 POSITION 17,23:? #6;D
1890 RETURN
1900 REM *** LEVEL COMPLETE TUNE ***
1910 FOR I=255 TO 185 STEP -7:SOUND 0,
I-1,10,12:SOUND 1,I,10,12:FOR M=0 TO 5
:NEXT M:SOUND 0,0,0,0:SOUND 1,0,0,0
1920 FOR M=0 TO 5:NEXT M:NEXT I
1930 FOR I=210 TO 145 STEP -7:SOUND 0,
I-1,10,12:SOUND 1,I,10,12:FOR M=0 TO 5
:NEXT M:SOUND 0,0,0,0:SOUND 1,0,0,0
1940 FOR M=0 TO 5:NEXT M:NEXT I
1950 FOR I=165 TO 100 STEP -7:SOUND 0,
I-1,10,12:SOUND 1,I,10,12:FOR M=0 TO 5
:NEXT M:SOUND 0,0,0,0:SOUND 1,0,0,0
1960 FOR M=0 TO 5:NEXT M:NEXT I
1970 SOUND 0,90,10,12:SOUND 1,90,10,12
:SOUND 3,92,10,12:FOR I=0 TO 100:NEXT
I:FOR M=0 TO 3:SOUND M,0,0,0:NEXT M
1980 RETURN
2000 REM *** PLANE HIT ***
2010 POKE 1586,0:POKE 1585,0
2020 A=USR(CLEAR,1):FOR I=0 TO 3:SOUND
 I,0,0,0:NEXT I
2030 P=0:F=0:GO=1000:T=2
2040 FOR I=1 TO 6
2050 GO=GO+10:SO=SO+1:GOSUB GO
2060 IF B=1 THEN SOUND 3,PEEK(1563)+4,
10,6
2061 IF B=1 AND PEEK(1563)>200 THEN A=
USR(CLEAR,3):B=0:SOUND 3,0,0,0
2062 FOR M=1 TO 10
2063 A=USR(L,0,PM+20)
2064 A=USR(L,0,PM+40)
2070 NEXT M:NEXT I:POKE 1586,8
2080 POKE 53256+T,1
2090 SC=SC+50:GOTO 1320
3000 REM *** GAME OVER ***
3010 A=USR(L,2,PM+103):FOR I=0 TO 3:SO
UND I,0,0,0:NEXT I:SOUND 2,80,4,4:POKE
 54286,64:POKE 1634,0
3020 A=USR(CLEAR,0):A=USR(CLEAR,1):A=U
SR(CLEAR,3):POKE 1586,7
3030 GRAPHICS 18:POKE 756,132:POKE 559
,62:POKE 16,64:POKE 53774,64
3040 POKE 708,200:POKE 709,14:POKE 710
,52:POKE 711,136:POKE 32140,255
3050 POSITION 3,0:? #6;"chopper rescue
"
3060 IF  NOT FU THEN POSITION 4,2:? #6
;"out of fuel":GOTO 3080
3070 POSITION 5,2:? #6;"game over"
3080 POSITION 3,4:? #6;"MEN RESCUED ";
MR
3090 N$=STR$(SC):S$="00000":S$(6-LEN(N
$))=N$:POSITION 2,6:? #6;"LAST SCORE "
;S$
3100 N$=STR$(HI):S$="00000":S$(6-LEN(N
$))=N$:POSITION 2,8:? #6;"HIGH SCORE "
;S$
3110 POSITION 4,10:? #6;"PRESS START"
3120 FOR I=14 TO 0 STEP -1:SETCOLOR 1,
0,I:FOR M=1 TO 10
3130 IF PEEK(53279)=6 THEN POP :GOSUB
5620:GOTO 80
3140 POKE 710,PEEK(20):NEXT M
3150 NEXT I:POKE 707,0
3160 GOSUB 1100:POKE 1579,1
3170 GOTO 3120
4000 REM *** DRAW GRAPHICS ***
4010 GRAPHICS 17:POKE 559,0
4020 GOSUB 4930
4030 POKE 752,1
4040 FOR I=2 TO 19:COLOR 162
4050 FOR M=0 TO INT(RND(0)*(LEV+9))
4060 PLOT I,21:DRAWTO I,21-M
4070 NEXT M
4080 COLOR 163:PLOT I,21-M
4090 NEXT I
4100 POSITION 0,18:? #6;CHR$(33);CHR$(
33)
4110 FOR I=19 TO 21
4120 POSITION 0,I:? #6;CHR$(162);CHR$(
162)
4130 NEXT I
4140 GOSUB 1320
4150 POSITION 0,23:? #6;"WAVE ";LEV
4160 POSITION 12,22:? #6;"MEN 0"
4170 POSITION 12,23:? #6;"DEAD 0"
4180 POSITION 0,22:? #6;"FUEL ";FU
4190 FOR I=1 TO LI
4200 POSITION 15+I,0:? #6;CHR$(168):NE
XT I
4210 FOR I=1 TO LIM
4220 X=INT(RND(0)*18+2)
4230 Y=INT(RND(0)*17+3)
4240 LOCATE X,Y,Z
4250 IF Z=32 OR Z=4 THEN 4220
4260 POSITION X,Y:? #6;CHR$(4)
4270 NEXT I:RETURN
4930 POKE 16,64:POKE 53774,64
4940 GOSUB 6200
4950 POKE 712,0
4960 POKE 756,132
4970 POKE 708,10:POKE 709,200
4980 POKE 710,40:POKE 711,6
4990 RETURN
5000 REM *** PLAYER MISSILE VBI ***
5010 L=32256:CLEAR=32210
5020 IF PEEK(32000)=72 THEN 5300
5030 RESTORE 5100
5040 FOR I=1536 TO 1587:READ A:POKE I,
A:NEXT I
5042 FOR I=32000 TO 32194:READ A:POKE
I,A:NEXT I
5044 FOR I=32256 TO 32328:READ A:POKE
I,A:NEXT I
5046 FOR I=32210 TO 32241:READ A:POKE
I,A:NEXT I
5100 DATA 104,160,0,162,125,169,7,76,9
2,228,104,160,98,162,228,169,7,76,92,2
28
5110 DATA 120,120,120,120,120,57,81,10
5,15,15,15,15,0,0,0,0,52,53,54,55,2,2,
2,4,0,15,15,15,15,15,15,15
5120 DATA 72,138,72,152,72,162,0,189,1
20,2,29,44,6,160,15,56,176,32,201,15,2
40,28,201,14,208,2,160,13,201,13
5130 DATA 208,2,160,14,201,11,208,2,16
0,7,201,7,208,2,160,11,192,15,240,6,61
,48,6,157,28,6,152,61,44,6
5140 DATA 157,44,6,232,224,4,144,195,1
62,0,189,32,6,133,203,189,36,6,133,204
,189,40,6,133,209,198,209,16,7,232
5150 DATA 224,4,144,232,176,91,189,28,
6,133,207,70,207,176,26,188,24,6,192,4
8,240,19,208,1,200,177,203,240,6,136
5160 DATA 145,203,200,208,245,136,145,
203,222,24,6,70,207,176,29,188,24,6,20
0,192
5170 DATA 212,176,21,177,203,208,247,1
36,177,203,240,6,200,145,203,136,208,2
45,200,145
5180 DATA 203,254,24,6,70,207,176,3,22
2,20,6,70,207,176,3,254,20,6,189,20,6,
157,0,208,24,144,154
5190 DATA 104,168,104,170,104,76,98,22
8
5200 DATA 234,234,234,104,104,104,170,
189,32,6,133,186,189,36,6,133,187,104,
133,213,104,133,212,189,24
5210 DATA 6,133,195,169,0,164,195,136,
136,145,186,200,234,145,186,200,234,23
4,234,162,0,161,212,240,11
5220 DATA 145,186,230,212,200,192,255,
176,11,208,241,169,0,145,186,200,145,1
86,234,234,96,234,234
5250 DATA 32,11,6,104,104,170,189,
32,6,133,186,189,36,6,133,187
5260 DATA 169,0,168,234,145,186,200,19
2,255,144,248,32,1,6,96
5300 POKE 704,40:POKE 705,238:POKE 706
```

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◀ From Page 49

```
,136:POKE 707,136:POKE 623,1
5310 A=PEEK(106)-16:POKE 54279,A:PM=25
6*A
5320 FOR I=4 TO 7:POKE 1568+I,A+I:NEXT
 I
5330 FOR I=1568 TO 1571:POKE I,0:NEXT
I
5340 POKE 53277,3:POKE 53258,1
5350 IF PEEK(PM)=255 THEN 5610
5500 FOR I=PM TO PM+259:READ A:POKE I,
A:NEXT I
5510 DATA 255,36,24,60,66,90,90,126,60
,36,66,231,0,0,0,0,0,0,0,0
5520 DATA 248,36,24,60,66,90,90,126,60
,36,66,231,0,0,0,0,0,0,0,0
5530 DATA 31,36,24,60,66,90,90,126,60,
36,66,231,0,0,0,0,0,0,0,0
5540 DATA 24,24,64,60,26,24,36,102,0,0
,0,0,0,0,0,0,0,0,0,0
5550 DATA 0,0,0,24,60,60,24,0,0,0,0,0,
0,0,0,0,0,0,0,0
5560 DATA 0,0,0,56,156,242,255,126,28,
56,112,0,0,0,0,0,0,0,0,0,0,0,28,57,7
9,255,126,56,28,14,0,0,0,0,0,0,0,0,0
5570 DATA 60,126,239,254,191,247,254,1
18,0,0,0,0,0,0,0,0,0,0,0,60,60,60,24
,60,110,118,110,52,24,0,0,0,0,0,0
5580 DATA 0,0,0,0,8,32,16,0,16,8,32,4,
16,0,16,4,32,72,18,68,16,0,0,0
5590 DATA 8,32,2,68,17,132,66,8,16,0,0
,0,0,0,0,0,0,0,0,0
5600 DATA 16,4,64,2,40,4,130,80,9,32,2
0,128,34,8,16,0,0,0,0,0,128,128,184,16
8,56,7,5,7,0,0,0,0,0,0,0,0,0,0,0,0
5610 REM *** INITIALISE VARIABLES ***
5620 POKE 1577,3:POKE 1576,1:POKE 1578
,1:POKE 1579,1:SOUND 2,0,0,0
5630 POKE 1556,52:POKE 1560,173
5640 POKE 1562,50:POKE 1586,7
5650 DIFF=240:D=0
5660 LEV=1:LIM=5:MR=0
5670 POKE 32140,212
5950 FU=201:MAN=0:CM=0
5960 SC=0:LI=3
5970 F=0:SO=7:B=0:P=0
5980 RETURN
5990 REM *** NEW CHARACTER SET ***
6000 CHSET=33792:RESTORE 6050:IF PEEK(
CHSET+8)=255 THEN 6040
6010 FOR I=0 TO 63:READ A:POKE CHSET+8
+I,A:NEXT I
6020 FOR I=264 TO 471:READ A:POKE CHSE
T+I,A:NEXT I
6030 FOR I=128 TO 207:READ A:POKE CHSE
T+I,A:NEXT I
6040 RETURN
6050 DATA 255,255,195,102,60,24,60,102
,126,247,237,187,94,251,247,93
6060 DATA 0,1,5,141,171,191,122,215,22
4,208,8,240,200,220,182,99,16,4,64,2,4
0,4,130,80
6070 DATA 60,126,239,254,191,247,254,1
18,0,3,1,1,1,223,209,255,126,24,60,66,
90,60,24,102
6080 DATA 63,63,51,115,127,99,99,0,62,
51,51,126,115,115,126,0,63,51,48,112,1
12,115,127,0
6090 DATA 126,102,102,103,103,103,127,
0,63,48,48,124,112,112,127,0,63,48,48,
124,112,112,112,0
6100 DATA 63,51,48,119,118,118,126,0,5
1,51,51,127,115,115,115,0,12,12,12,28,
28,28,28,0,6,6,6,7,103,127,127,0
6110 DATA 51,51,54,124,118,115,115,0,4
8,48,48,112,112,115,127,0,51,63,51,115
,115,115,115,0
6120 DATA 62,51,51,115,115,115,115,0,6
3,51,51,115,115,115,127,0,63,51,51,115
,126,112,112,0
6130 DATA 62,54,54,118,118,118,127,0,6
3,51,51,115,126,118,115,0,63,99,96,127
,3,99,126,0,127,24,24,56,56,56,56,0
6140 DATA 102,102,102,103,103,127,63,0
,51,51,51,115,115,126,124,0,51,51,51,1
15,115,127,115,0,99,99,54,28,54,99
6150 DATA 99,0,99,99,99,62,28,28,28,0,
127,103,12,24,51,99,127,0
6160 DATA 126,118,118,103,103,103,127,
0,28,12,12,14,14,14,14,0,127,99,3,127,
112,115,127,0,126,102,6,31,7,103,127
6170 DATA 0,102,102,102,127,7,7,7,0,12
7,99,96,127,3,99,127,0,63,51,48,127,11
5,115,127,0,126,102,6,7,7,7,7,0
6180 DATA 62,54,54,127,115,115,127,0,1
26,102,102,127,3,3,127,0
6190 REM *** DLI DATA ***
6200 IF PEEK(1600)=72 THEN 6250
6210 RESTORE 6220:FOR I=1600 TO 1657:R
EAD A:POKE I,A:NEXT I
6220 DATA 72,138,72,175,98,6,189,99,6,
141,10,212,141,24,208,232,142,98,6,138
,24,233,23,208,5,169,0,141,98,6
6230 DATA 104,170,104,64,0
6240 DATA 250,250,250,250,250,250,248,
248,248,248,248,248,246,246,246,246,24
6,246,242,242,242,102,40
6250 POKE 512,64:POKE 513,6
6260 POKE 54286,192
6270 DL=PEEK(560)+256*PEEK(561)+6
6280 POKE DL-3,199:FOR I=DL TO DL+22:P
OKE I,166:NEXT I
6290 RETURN
```

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
10	3789	20	4562	30	3383
40	871	50	11412	60	5865
70	3910	80	1934	90	13305
100	3530	110	1797	120	2221
130	2893	140	6565	150	3795
160	5541	170	9157	180	1898
190	2903	200	6080	210	5992
220	8464	230	6505	240	6565
250	3795	260	1605	270	1911
280	1611	300	4403	310	9219
320	10397	330	1498	340	8153
350	1498	360	4227	370	5159
380	12575	390	1498	400	3750
410	5749	420	4451	430	13594
440	7683	450	4155	500	4810
510	5776	520	2062	530	3732
540	3919	550	5392	560	551
570	1498	600	4423	610	5717
620	4396	630	5978	640	1977
650	2092	660	3096	670	1827
680	3628	690	1345	700	3608
710	4832	720	2145	730	2330
740	2128	750	5021	760	2367
800	5384	810	4269	820	5577
830	5564	840	4262	850	5557
860	5556	870	5561	880	7658
890	4012	900	5801	910	5327
920	5028	930	4724	940	5377
941	3177	942	2930	943	3137
944	2351	945	5387	950	4922
960	4243	970	5435	980	3031
990	5613	1000	5626	1010	7855
1020	7871	1030	7858	1040	7833
1050	10508	1060	5678	1070	4909
1100	4460	1110	8696	1120	8174
1130	13235	1140	7365	1150	3752
1160	3954	1170	5262	1180	1498
1200	5007	1210	7921	1220	2002

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
1230	3554	1240	1869	1250	7404
1260	1345	1270	4734	1280	5377
1281	2351	1282	10794	1283	4858
1286	3537	1290	4917	1300	2882
1310	4836	1320	4288	1330	2035
1340	4219	1350	3843	1360	3765
1370	1986	1380	4219	1390	5519
1400	4071	1410	3969	1420	4719
1430	5377	1435	3177	1440	6956
1450	3974	1460	2468	1470	1865
1500	4082	1510	4015	1520	3966
1530	16259	1540	19593	1550	4214
1560	5955	1570	3867	1580	3545
1590	11154	1600	14225	1610	4734
1620	1961	1630	12569	1640	4540
1650	6851	1660	5318	1670	3374
1680	3664	1690	3877	1700	4179
1710	1954	1720	4469	1730	2367
1750	5756	1760	8934	1770	7025
1780	3049	1790	16883	1800	2321
1810	2903	1820	1345	1830	2882
1840	2128	1850	3681	1860	3287
1870	887	1880	3696	1890	1498
1900	5603	1910	18831	1920	5093
1930	18786	1940	5093	1950	18814
1960	5093	1970	19074	1980	1498
2000	3461	2010	4142	2020	8878
2030	3470	2040	2092	2050	4962
2060	6505	2061	11376	2062	2273
2063	2893	2064	2903	2070	4832
2080	2643	2090	3302	3000	3489
3010	16627	3020	10715	3030	10922
3040	11293	3050	7837	3060	15364
3070	9237	3080	6622	3090	13267
3100	13152	3110	10213	3120	8855
3130	8185	3140	4601	3150	3290
3160	4035	3170	1863	4000	4401
4010	4114	4020	1985	4030	1844

LINE	CHSUM	LINE	CHSUM	LINE	CHSUM
4040	4269	4050	5432	4060	4487
4070	1353	4080	4002	4090	1345
4100	6145	4110	2410	4120	6425
4130	1345	4140	1947	4150	5692
4160	6404	4170	4835	4180	7571
4190	2450	4200	6821	4210	2835
4220	3263	4230	3267	4240	2351
4250	4530	4260	4695	4270	3164
4930	4449	4940	1948	4950	1831
4960	2112	4970	4334	4980	3885
4990	1498	5000	5680	5010	3485
5020	4447	5030	2287	5040	7568
5042	7973	5044	7977	5046	7960
5100	11153	5110	14352	5120	15420
5130	14536	5140	15820	5150	16226
5160	11442	5170	12222	5180	13683
5190	5513	5200	14593	5210	14633
5220	13829	5250	9469	5260	8593
5300	10709	5310	6366	5320	6345
5330	6191	5340	4400	5350	4527
5500	7846	5510	8978	5520	8987
5530	8766	5540	7906	5550	7088
5560	15709	5570	15375	5580	9444
5590	7677	5600	15487	5610	5864
5620	10662	5630	4469	5640	4342
5650	2150	5660	3326	5670	2546
5950	3128	5960	1811	5970	2892
5980	1498	5990	5378	6000	10255
6010	8352	6020	8365	6030	8361
6040	1498	6050	9650	6060	12124
6070	12513	6080	12560	6090	13184
6100	15451	6110	12790	6120	12737
6130	15966	6140	15714	6150	8935
6160	15934	6170	15362	6180	8619
6190	3236	6200	4399	6210	9996
6220	15327	6230	3350	6240	14427
6250	3893	6260	2615	6270	4841
6280	9333	6290	1498		

Just the stuff to speed your output



ROLAND WADDILOVE assesses a 64k printer buffer designed to increase your system's efficiency

HAVE you ever sat twiddling your thumbs while waiting for the printer to print a long document or listing? Yes? Well MicroStuffer is designed to avoid this holdup altogether by providing a massive 64k printer buffer.

One of the problems of using a computer with a printer is the fact that they both run at different speeds. Computers like the Atari process information at quite a high speed, yet printers can only print the data provided by the micro relatively slowly. This forces the micro to reduce its speed to match that of the printer.

The effect of this is apparent when printing long documents or screen dumps – the micro is tied up for several minutes while the printer clatters away, preventing you from getting on with your work.

To make matters worse, the better the quality of print, the slower the printer runs and the longer the micro is tied up. This is why many printers, and even some software packages, have a draft and final quality print mode.

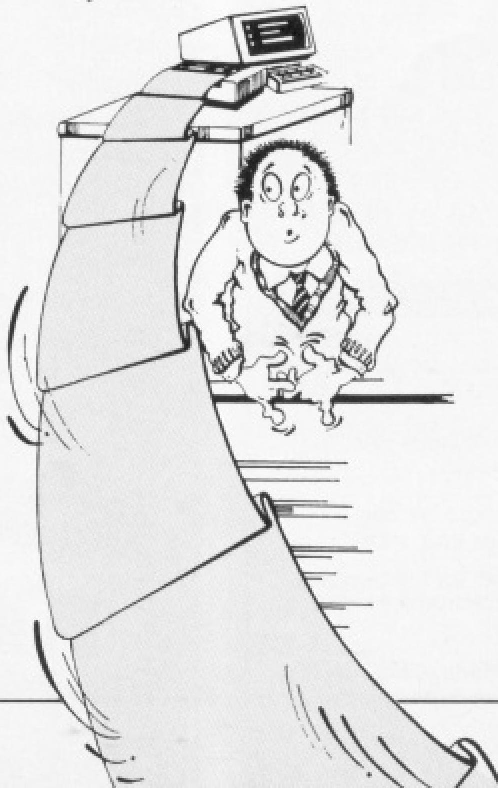
If you want a rough idea of what the document looks like on paper you use draft mode for speed. When everything is to your liking you use final quality – which may take up to twice as long to print, but the finished article is much more presentable.

A printer normally has a very small amount of ram on board, typically 1k or so, which it uses as a buffer. When there's room a signal is sent to the micro telling it to send some more text. The micro sends characters until the printer again signals the buffer is full and waits for it to print more text.

When the buffer has space again the printer requests more text from the micro. It sends this so quickly the buffer fills in no time at all and consequently spends most of its time waiting for the printer to empty it. This time is wasted as the micro can't be used for anything else.

The larger the printer's buffer the more text the micro can dump in it before it becomes full. If it is very large, say 64k as in the MicroStuffer, the whole of the text will easily fit in.

The micro quickly dumps all the text in to the buffer and you can start on your next task straight away. The printer will print all the text in the buffer regardless of what the micro is doing (in fact you can even switch it off) so you can get on with the rest of your work.



So this is the idea behind the MicroStuffer – a large buffer is added between the computer and printer and the micro dumps all the output in it. The printer prints while the micro is free to process the next document, screen dump or report.

The unit is small, unobtrusive and can be tucked away in a corner of the desk. It comes complete with its own power supply.

The socket on the back of the cream coloured case is identical to the one on the printer and this is where you plug in your printer lead. A short cable runs to a plug which fits into the printer's socket.

All you do is plug in, switch on and it's ready to go – it couldn't be simpler. In fact you won't notice it's there – except for the time saved.

There is an on/off switch, and two buttons on the front of the unit. One is a repeat button which reprints the contents of the buffer, the other is a panic button.

If you fill the buffer with text and suddenly discover an error you can hit the Clear button and flush it. You can't do this from the computer.

MicroStuffer isn't cheap, but if you find your time is being wasted waiting around for the printer it could improve your efficiency no end. If you rarely use your printer it isn't necessary, but if you regularly print large documents it could easily repay itself in time saved very quickly.

To it's credit, it isn't micro-specific and will work with any computer and printer combination with Centronics type ports.

Product: MicroStuffer
Price: £49.95
Supplier: Supra Corporation, c/o Frontier Software, PO Box 113, Harrogate, North Yorkshire H92 OBE
Tel: 0423 67140

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Packing in the routines

LET'S kick off with a question from Roger Bowering of Dartford in Kent. Roger has been using lots of machine code routines, many of which reside in page 6 of memory. He asks if there is any way to enable him to use several routines within one program.

As you know, page 6 is the spare area of memory at $600 which neither Basic nor the operating system access. Because of this many programmers tend to store small machine code routines and data here – but this can cause a conflict if more than one routine needs to be used at the same time.

Well, there are a number of ways round this problem, but they all depend on the way the routine is written. Some of our Five Liner programs will have been been assembled to be *position independent*, which means that they can reside anywhere in memory and still work.

In such cases you simply alter the loop which POKEs the data into memory, adding perhaps 128 to the value.

Don't forget to add the same amount to the USR address used to call the routine. Page 6 is only 256 bytes long, so watch that there is space for everything you want to store there. You should never let your POKEing loop extend beyond location 1791 ($6FF) or you will start to overwrite Dos or Basic's workspace.

A lot of machine code can't be moved in this manner, especially if it involves storing a lot of working data in the page 6 area. Code such as this must be *relocated*. In order to do this you will often have to reassemble it from the original source code.

In the case of a previously written program this will involve a complicated process of converting the data bytes back into the mnemonic system (which uses LDA, STA, BEQ, JMP and so on rather than just numbers) and then adjusting the code to allow you to use it somewhere else in memory.

In effect you will be changing the *=$600 line telling the assembler where to place your final machine code.

A much better idea is that everyone writes position-independent code in the first place. This sort of machine code routine is often stored in a string and thus may be placed anywhere in memory. This leaves the whole of page 6 free – possibly for those odd bytes of non-relocatable data storage?

In order to convert from page 6 to a string (assuming the routine will work in a string) you must first work out the length of the routine, then DIM the string to that length. Next, you must move the machine code into the string using PEEK and substrings. Finally you must find the new address of the routine with ADR$.

To see this in practice, consider the following:

```
10 FOR MEM=1536 TO 1543
20 READ BYTE: POKE MEM,BYTE
30 NEXT MEM
40 ANSWER=USR(1536,P1,P2,ETC)
50 DATA 104,133,212,169,0,133,213,96
```

This would READ the data from line 50 and POKE it into the start of page 6, then run the routine. Memory locations 1536 to 1543 are used, which means that the machine code itself is eight bytes in length. Obviously this is far shorter than any real program is likely to be, but it makes the example very much simpler. In fact, all it does is to tell you how many parameters you used.

To use the routine in a string you would alter it as follows:

```
1 DIM CHAR$(8)
10 FOR CH=1 TO 8
20 READ BYTE: CODE$(CH,CH)=CHR$(BYTE)
30 NEXT CH
40 ANSWER=USR(ADR$(CODE$),P1,P2,ETC)
50 DATA 104,133,212,169,0,133,213,96
```

Line 1 sets the string up for eight characters, then lines 10 to 30 go through it, one character at a time, placing the DATA values in as CHR$ numbers. Line 40 finds the address of the string (and hence the routine) for use in the USR call. Line 50 is the same DATA as before.

This technique can be modified for the various different methods people employ to store their data, and so long as the routine is relocatable it will work. Don't forget to save a copy before you RUN it, just in case it isn't and it doesn't.

Player missile registers

The next question is from Jamie Cowan from Fenwick in Ayrshire who

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◀ From Page 53

wants to know why many locations in memory seem to have two functions. In particular, he wants to know about the player missile registers at $D000.

If you cast your mind back to the June issue of *Atari User* you will remember that I answered a question on shadow registers and how they work. Well, all the locations you are talking about are actually hardware registers – that is to say that they directly control the operation of the computer and don't require the operating system to pass values from them to somewhere else.

Each of these locations is actually a memory-mapped control register for one of the Atari support chips – in this case the GTIA chip. Each time a value is placed into one of these locations it adjusts the operation of GTIA in the same way as you would adjust the controls of your television set.

In a similar way, locations $D200 onwards control POKEY, $D300 to $D303 control the two PIA I/O chips and $D400 onwards control the wonder-chip ANTIC.

Because of the complexity of circuit board and chip design, many registers only work 'one-way'. If a register is designated as *write-only* then you can POKE to it but you won't be able to PEEK the number back again.

This applies to the colour registers at $D016, the fine scroll registers and many others. In some other cases (*read-only* mode) you can read data about the functioning of the chip, but you can't write anything. This includes such locations as VCOUNT and the consol key register at $D01F.

Indeed, in many cases one register may have a completely different function when you read it to the one it has when you write to it.

For example, all of the Player/Missile position registers double up as collision detection locations. Thus, if you POKE (write) to $D000 you will adjust the position of Player Zero. Yet if you PEEK (read) it you will find the Missile-One-to-Playfield collision detector.

It is not good practice to try to read a hardware register you have just written to because very often you will receive a completely different answer to the one you expected. Only try to PEEK locations which you know to be available in read mode.

SOFTWARE Solutions

Are you having problems getting your programs to work? Write to Software Solutions, Atari User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. We will answer as many as we can within the pages of *Atari User* but, unfortunately we cannot give personal replies.

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Connecting up for those free games

I WAS looking for a computer magazine to help me with my Atari computer when I came across Atari User *and I was very pleased with it.*

I think the game listings are brilliant – but it can get a little frustrating typing the long listings in. It was then that I saw the advert for free games from MicroLink.

What do I need to get these and how do I go about it? – **Steve Spink, West Norwood, London.**

● Firstly, you will need a modem and the correct cable to go to your computer or interface box.

You will also need communications software, and you will have to join MicroLink. You can do this by filling in the application form in *Atari User*.

An ideal piece of software to buy to allow access to MicroLink is Mini Office II, as it is designed for ease of use – and the communications software allows very easy access to MicroLink.

You'll find an article on page 12 of this issue of *Atari User* explaining how to download software.

Atari's new disc drives

AFTER saving up for quite a while to buy an Atari 1050 disc drive I was very upset when I phoned Compumart and they informed me that it was no longer available and Atari are bringing out a new drive soon.

Could you please tell me if this is correct and how much this new drive will cost?

Also could you tell me if there is a cartridge-based language available that will allow re-numbering, autoline numbering, trace and a variable dump. – **Andrew Read, Doncaster, South Yorkshire.**

● Atari is bringing out a new disc drive – the XSD551 will replace the old 1050 drive. You may also be interested to know that as well as bringing out the new drive they also plan to bring out a new dot matrix printer – the XMM801.

The XSD551 disc drive is going to be double sided and have twice the storage capacity of the old 1050 drive as well as having a far superior loading time (a speed similar to the 1050 with a US Doubler chip installed).

It will retain full compatability with present software and probably sell for around £200.

Basic XE is a cartridge based language that will allow you all the commands from Basic you require. It also allows you to obtain a disc directory from Basic without going to Dos.

The cartridge is made by O.S.S (Optomised System Software) and can be bought from several of the advertisers in *Atari User* for approximately £79.

Not one of ours . . .

RECENTLY a disgusting piece of software has been circulating around computer clubs in the Leicester area.

It carries the name Jiro Software of Leicester, but this name is in no way to be linked with the actual company Jiro Software and we would like to disassociate ourselves completely from it.

We would also like to say that if the individual(s) concerned can prove that they have a prior claim to the name Jiro Software then we will gladly consider changing our name. – **Jirosoft, Claybrooke Magna, Leics.**

Suitable for TAB

COULD you please tell me if the Atari computer has the equivelant command to INKEY and TAB on the BBC micro. – **D. Fawcett, Risepark, Nottingham.**

● Unfortunately Atari Basic does not have an INKEY command.

It is possible for you to make the computer look at the keyboard for an input by opening a channel using the command OPEN#1,4,0,"A", where A is the reference to the key input.

Once this channel has been opened you can then use the GET#1,A to obtain a value for A. Remember to close the channel to the keyboard once you have finished with it.

Atari Basic does not have a TAB command but does have a POSITION statement. This works in the same way as the BBC micro's TAB command. for example try using:

```
10 POSITION 2,3:?"HELLO"
```

The first number is the horizontal position on screen and the second is the vertical position on screen.

Low priced games

I'VE been a dedicated Atari user for over eight years now but now I am getting fed up of the companies selling games for £1.99 – most of them are rubbish.

Admittedly there are exceptions, but on the whole they appear to be killing off the market for good software.

I am unemployed but would rather save the money and buy a piece of software that I was going to get satisfaction from.

In my opinion the Atari is still one of the best computers around, and if the software houses don't stop selling these silly budget priced games then they are going to kill the market for quality software.

On a milder point, could you please tell me if there are any plans to bring out World Class Leaderboard on the Atari as I am a great fan

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No Elite on horizon

I HAVE been a proud owner of an Atari computer for four years now and I am very happy with the software. I recently got in touch with Firebird to ask them when they are going to release the classic game Elite which is available on many other micro's. So why not the Atari?

Are software houses afraid that an Atari version will be far superior to any other version? If this game was written for Atari it would break all records of software sales. – **Trevor Harrison, HMSM Otter, c/o BFPO Ships, London.**

● As far as we know there are no plans to release Elite for Atari computers.

◀ From Page 55

of this game. – **A.N.F. Hull, North Humberside.**

● The budget games are designed to sell at a price that is affordable to most people and the quality can be way below the expensive software.

However, software that sells for ten times the price is occasionally no better than the cheaper software.

It is really unfair to slate all software house for dropping prices so that everyone can obtain games without breaking the bank. And it is very unlikely that the sale of budget games is going to ruin the market.

World Class Leaderboard is not available for the Atari computers at moment, and we know of no plans for it to be brought out.

ATARI USER Mailbag

WE welcome letters from readers – about your experiences using the Atari micros, about tips you would like to pass on to other users . . . and about what you would like to see in future issues.

The address to write to is:

Mailbag Editor
Atari User
Europa House
68 Chester Road
Hazel Grove
Stockport SK7 5NY

Reviewing the oldies

I WAS very pleased to receive my prize which I won in your birthday competition in Atari User. I just thought I would write to say thank you for the prize and for writing such a great magazine.

My favourite part of the magazine is the reviews section and I was wondering if it would be possible for you to review some of the older games that have been put on the software market again, as there are quite a lot about. – **Trisala Morris, Chard, Somerset.**

Saving to disc

I AM a novice on Atari computers and I have just bought myself a disc drive, but find that I am totally confused as to how to use it.

I have typed in several program listings from Atari User and try as I do I cannot manage to save them to disc. Can you please explain how to do it? – **P. Letch, Basildon, Essex.**

● Firstly, for you to use your Atari disc drive you will need a disc operating system (Dos). This piece of software is the lifeblood of your drive.

Place your Dos disc into the drive and switch on your computer. The disc drive should start and eventually Ready should appear on screen.

At this point type DOS, press Return and your disc operating system will be loaded. A menu will appear and at this point take out your Dos disc and place a blank disc in the drive.

Select option I for format disc and follow the prompts. Once your disc has been formatted you will need to write Dos files to it. Do this by selecting option H and following the prompts.

Now switch the computer off and boot your disc up by powering on. When the Ready comes up this time type in the listing and when you're ready to save it to disc type:

```
SAVE"D:filename.ext"
```

The filename can be any name you want to call the program but mustn't be more than eight characters long. The .ext is an extender and is used to label the files this is a maximum length of three characters, but you do not need to use it.

It is good convention to use .BAS for Basic files, .TXT for word processor files and so on.

To load a file once you have saved it you type: LOAD"D:filename.ext".

Try to remember the filename you chose but, if you forget, type Dos and select the directory option then return to Basic and proceed as before.

Helpful notes

I AM writing to tell you about a discovery I made while using Organ by Len Golding from the July 1987 of Atari User.

Once I had typed in the program and run it I found that, while having hours of fun playing tunes, if you press one of the notes and then press Help the note will be repeated until you either change the note or take your finger off Help. – **C Ringshall, Bromley, Kent.**

Matter of opinion

I DISAGREE completely with the review you gave Arkanoid in the July issue of Atari User. *It is reviews like this that make software houses – in this case Imagine – wonder why they even bother to write or convert software for the last few Atarians left on this earth.*

It is not as good as the ST version, but I think it is still one of the better pieces of software for the 8 bit Atari. And so think most of my

THOSE BOUNDER CHARACTERS

I OWN an Atari 800XL and enjoy typing the listings from your magazine. In the June 1987 issue of Atari User *you published a game called Bounder.*

Is it possible to obtain the characters printed on line 22 on an 800XL I am having a lot of trouble finding them. – **A Powley, Peckham, London.**

● The characters that appear on line 22 in the listing for Bounder are obtainable on an 800XL. You must use a combination of keys to obtain them.

These key combinations need the use of the Control, Inverse key and various other keys.

Here is a list of the Atascii codes for the characters you are looking for.

In the first set of qoutes the Atascii for the characters are as follows: 104, 162, 6, 153, 5, 169, 7, 32, 7, 228, 96. In the second set they are 104, 160, 98, 162, 228, 169, 7, 76, 7, 228 respectively.

By looking up the Atascii codes of these characters in one of the many tables available you'll be able to see the key combinations you need to obtain the characters.

fellow Atarians.

The graphics are adequate for such a game: Sound isn't really needed and the playability is out of this world.

I therefore urge other readers to follow my example and write to Imagine and thank them for finally writing and converting some software for the Atari 8 bit micro's – which still rates as one of the best. – **Rob Nengerman, Zutphen, Holland.**

● Reviews are a matter of opinion, and in this case the reviewer's disagreed with yours. Do any of our readers have any views they would like to express?

RIGHT LOUD AND CLEAR

AFTER reading your Gadgets article in the July 1987 issue of Atari User *about the speech synthesiser I decided to build it, and to my delight it worked first time.*

After this I began to consider possible applications for it. I decided that the Get it Right! program would be ideal to experiment with, so I made the needed modifications to the program, which are unfortunately too long to list in this letter.

I am now the proud owner of a talking Get it Right! computer. So could you please give my regards to Len Golding for his wonderful gadget. I am sure it will give me many more hours of fun. – **Peter Webb, Acklam, Cleveland.**

● We are always happy to hear from Atari users who have success with their projects and the idea of a speaking Get it Right! is certainly very original. If you have any more ideas on this subject then let us know.

Faulty recorder

I BOUGHT an Atari 800XL and tape recorder from Dixons and have had nothing but trouble with it. When the first one broke I took it back to the shop and they replaced it.

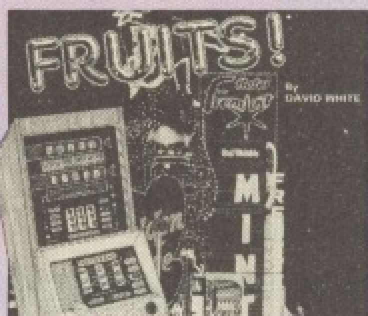
But when the replacement broke not long after and I took it back they would not replace it saying that they did not stock it any more.

When I checked a friend's deck I discovered that his is an Atari 1010 and mine is a Phonemark. Have Dixons made a mistake or is there a fault with Phonemark tapedecks? – **R M Hollyoak, Richmond, Surrey.**

● Dixons have not made a mistake in giving you a Phonemark tapedeck as quite a lot of the 800XL package deals had this particular recorder in it.

Unfortunately, although they work, they are not the best tapedeck to use with your Atari – the Atari 1010 is the better of the two.

Atari now makes a new tapedeck, the XC12 data recorder, which is of a very high standard and it can be bought from several of the advertisers in *Atari User* for around £32.



Tasty fruits

I HAVE just finished typing in the excellent Fruits program from the March issue of Atari User. It took about five days to type in all those data statements but in the end it was worth it.

So to all you gambling fanatics out there who have seen the listing but have been put off it because of the size, I recommend you to type it in because, as Atari User *mentions, it will certainly satisfy your gambling habit!*

I give the program 9 out of 10 and congratulate David White.

How does the Insert command on AtariArtist affect the loading of a picture file with the Dump 15 program published in the July edition of Atari User?

And will the Insert command work with a cassette system, as I have produced a picture and would like to use the loader routine from the Dump 15 program. – **A. Fisher, Fairwater, Cardiff.**

● The Insert option on AtariArtist is an undocumented feature of the program.

When a file is saved using the SAVE command it is saved in tokenised form with the colour register information, but when the Insert option is used the file is saved as a 62 sector file to drive 1 but with no colour information.

This option will not work with a cassette system as the program defaults to drive 1 automatically when the file is saved.

The loader routine from Dump 15 is slow due to the fact that it has to calculate the printer plots for each line.

It would therefore be unsuitable for you if you only want to load a single picture file.

Data mistakes

I HAVE typed in the disassembler listing from the July 1985 issue of Atari User *and found that when I ran it it came up with the message "Wait a moment" followed by an error – 8 at line 90.*

When I checked the program line 90 was typed in correct according to your listing. I hope you can help me with my problem. – **Martin Ritchie, County Down, Northern Ireland.**

● Most problems with listings come from the same source – typing errors. Error 8 at line 90 indicates that you are attempting to read a alphabetic character for a numeric value.

This means that somewhere in your data statements you have made an error and you will probably find that you have placed an extra comma in the data.

Remember that error reports do not always report the actual line where the error is.

Controller board fitting

IN the June 1987 issue of Atari User *there is an advertisement for the O.S. Controller board by Computerhouse. The list of its functions seems endless and some of the utilities seem too good to be possible.*

All in all it would appear that this is a must for all Atari computers. Could you please tell me if it fits inside a 130XE or does it plug in the back. – **Craig Buckton, Normanby, Cleveland.**

● The board sits on the motherboard of your computer and requires the removal of two chips. This task is a little tricky, but as long as you take care when you do it there should be no problem.

If you can't solder it in yourself then Computerhouse will fit it free. The board is software controlled and allows you to alter the parameters of the operating system. We hope to review it soon.

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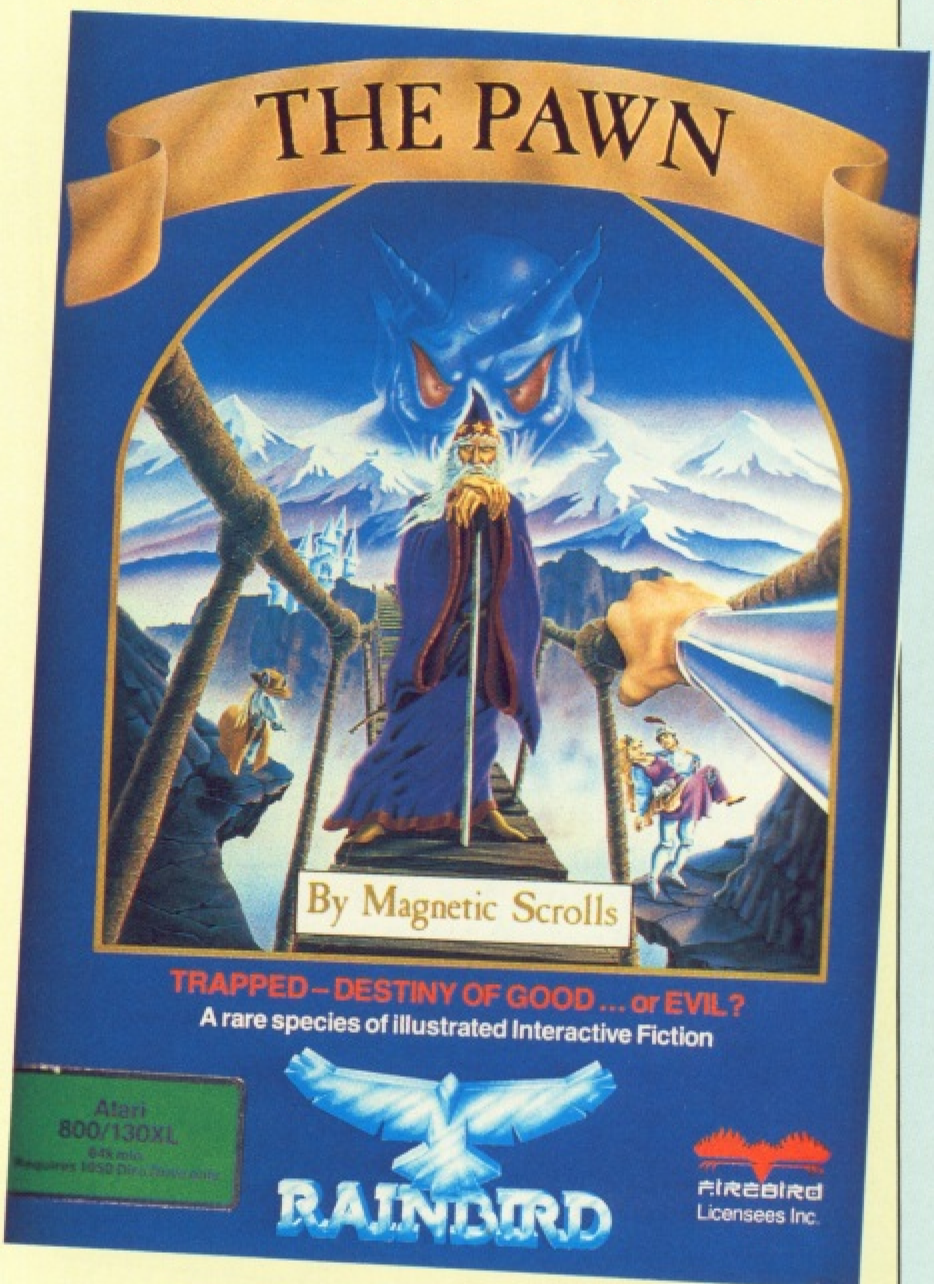
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"The program took three man years of programming time to produce – and it shows. The Pawn is the stuff from which cults are made."

– Anthony Ginn, writing about the Atari ST version in the May 1986 issue of the Atari User

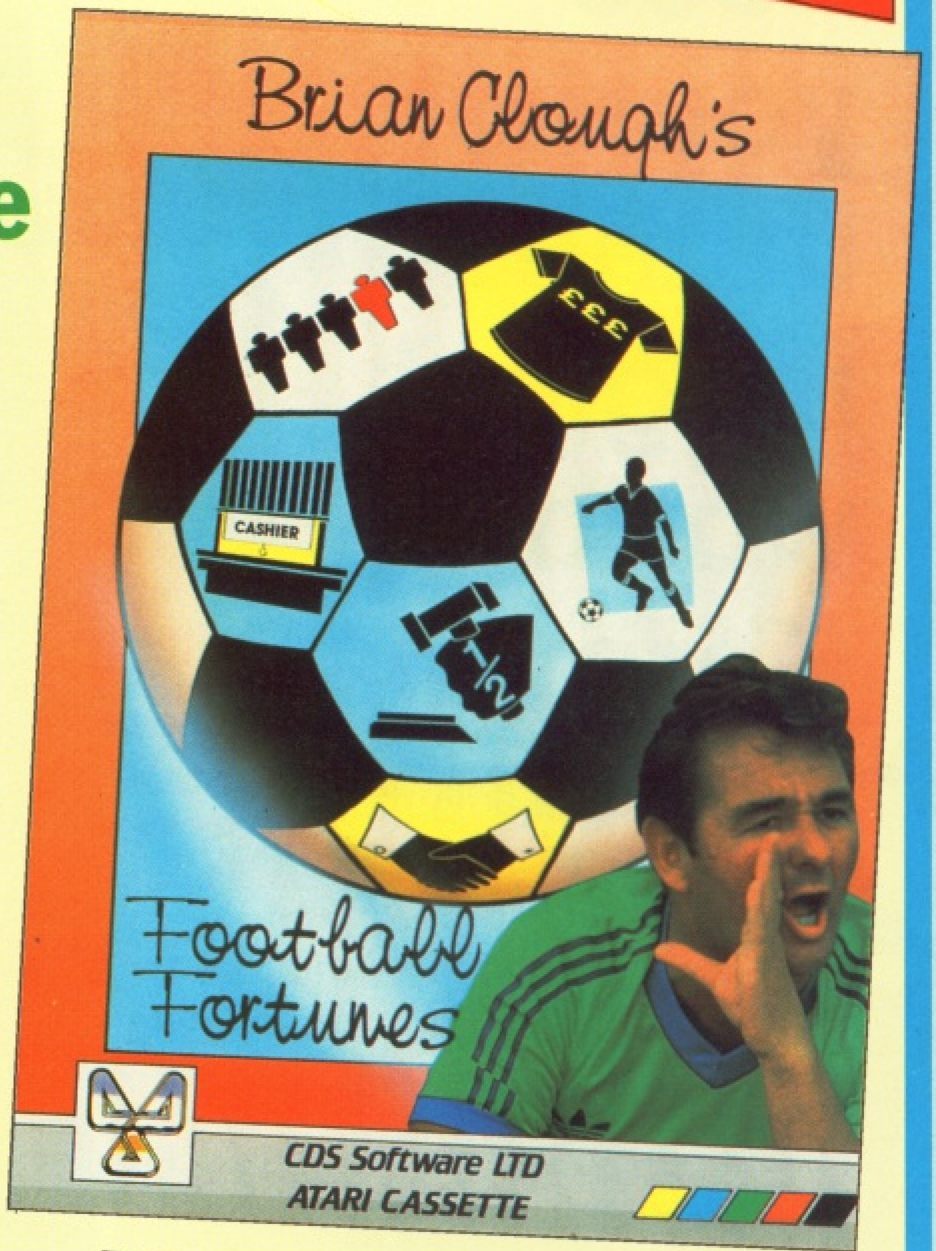
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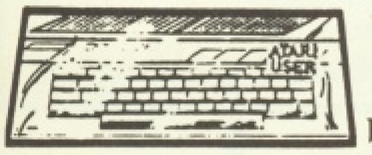
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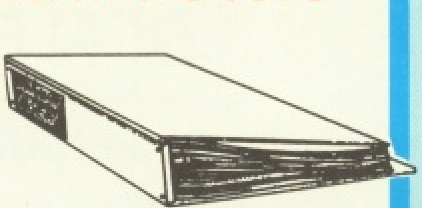


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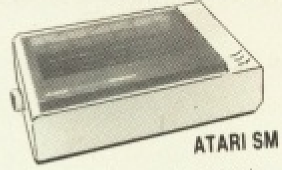
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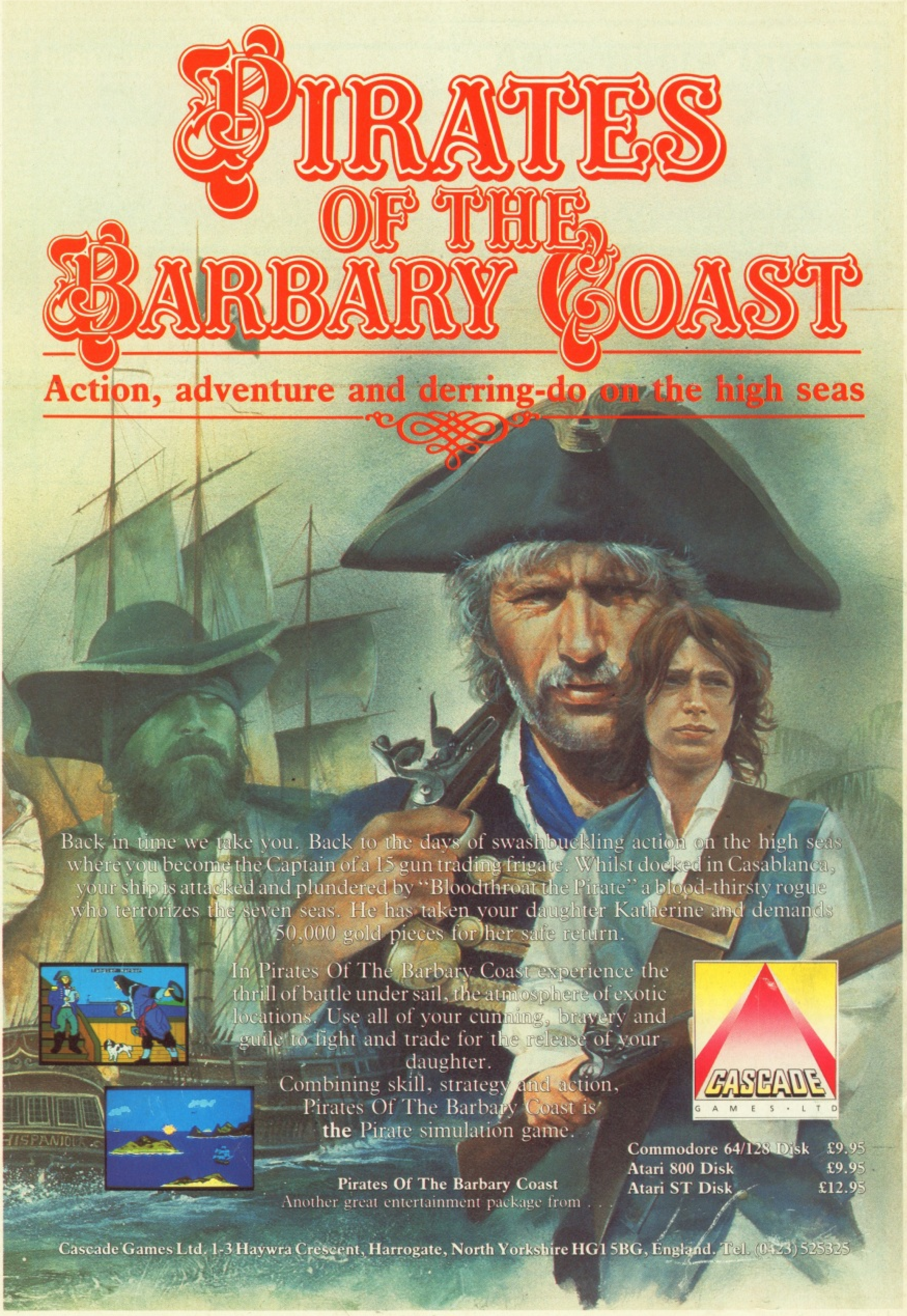


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